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An Evaluation of the 1997 Fiscal Decentralization Reform in Mexico: The Case of the Health Sector*

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Abstract
This paper studies the impact of the health decentralization of funds and responsibilities that took place in Mexico in 1997 on state level health outcomes. It renders two main results. First, the magnitude of transfers from the federal government to states failed to take into account state-specific needs; instead, transfers were mainly determined by the pre-reform health expenditures of the federal government in each state. Second, decentralization did not boost the advances in health outcomes already achieved under the centralized health sector regime. We conclude by discussing plausible reasons for the disappointing impact of decentralization on health outcomes.
Keywords: Fiscal decentralization, federalism, health.
JEL Classification: H51, H75.

Resumen
Este documento estudia el impacto de la descentralización de los fondos y responsabilidades en materia de salud que se llevó a cabo en México en 1997 sobre medidas de bienestar en salud a nivel estatal. Obtenemos dos resultados principales. Primero, la magnitud de las transferencias del gobierno federal a los estados no tomó en cuenta las necesidades específicas de salud de cada uno de los estados; en cambio, las transferencias estuvieron principalmente determinadas por el gasto en salud que el gobierno federal ejecutaba en cada estado previo a la reforma. Segundo, la descentralización no mejoró los avances en salud logrados durante el régimen centralizado de salud. Concluimos discutiendo las posibles razones por las que se explica el decepcionante impacto de la descentralización sobre las medidas de bienestar en salud.
Palabras Clave: Descentralización fiscal, federalismo, salud.

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I. Introduction

Fiscal decentralization has been part of the reform agenda in many developing countries for the last two decades. Theoretically, state and local fiscal autonomy is founded on the idea that public policy decisions by lower tiers of governments would bring about more efficient outcomes in the provision of public goods (Oates, 1972). It is argued that sub-national governments are better able to identify the needs and preferences of citizens. Under fiscal decentralization taxpayers are closer to authorities, allowing them to demand transparency, accountability, and efficiency in the use of public resources. As a result, decentralization is expected to generate economic growth and improvements in the welfare of the population.[1] Having these positive effects in mind, Mexico undertook a profound reform in the 1990s to modify the expenditure responsibilities of the Federation and state governments. The main aim of the reform was to transfer financial resources and responsibilities to state and local governments for the provision of specific public goods. By 1998, five earmarked funds were created (for basic education, health services, social infrastructure, municipal strengthening, and a multiple destination fund);[2] these were financed through federal transfers to sub-national governments.[3]

This paper focuses on one of these earmarked funds: the Health Services Fund[4] (FASSA, for its acronym in Spanish). Particularly, we analyze the consequences that such fund had over the health of the population according to specific health outcomes. We present results for infant mortality rate at the state level, a broadly used health indicator; but our results are robust to the use of other health indicators. With the

[1] However, fiscal federalism outcomes may be the opposite if political economy considerations are included in the analysis (Proudhome, 2004 and Weingast, 2009).

[2] In 1999 two more funds were added: for public safety and for technological and adult education.

[3] It is important to address that the reform focused on changing the expenditures assignments between states and federation but it did not modify tax collection responsibilities among tiers of governments. Federal government is still responsible for collecting more than 90 per cent of the public revenue of the country, but after unconditional and the earmarked federal transfers, sub-national governments spend around 50 per cent of the public expenditure in Mexico.

[4] In Spanish, Fondo de Aportaciones para Servicios de Salud (FASSA).

reform, states were in charge of organizing, controlling, coordinating, evaluating and monitoring the provision of health services and facilities; medical attention; maternity care; visual and hearing health; nutrition; epidemiology; among others for non-insured population. [5] In this context, FASSA's aim was to endow states with resources to meet their new health responsibilities that came with the decentralization of the sector. Decentralization meant that the medical attention of the non-insured (and therefore more vulnerable) population would now become the responsibility of state health authorities. Also, states were responsible for the administration of state hospitals for primary health care that used to be operated by the federal Ministry of Health (MofH hereafter) before the reform. One particular feature of the decentralization reform is that during the first years of the reform, states received an amount of economic resources from FASSA similar to what the federal MofH spent previous to the reform in each state. Another interesting feature is that the allocation of FASSA among states did not respond to particular health needs of states. These two facts, besides being clearly surprising, allow us to identify the impact on health indicators when health budget is spent by state governments rather than by the federal one.

We explore whether the decentralization of health provision can explain part of the improvements in state level health indicators that Mexico has experienced in the last twenty years. First, we discuss whether the institutional arrangement of health decentralization is appropriate to maximize the impact of each peso spent. For instance, the Law of Fiscal Coordination states a formula that specifies the factors used to calculate the share of the FASSA assigned to each state, but does not present the weights given to each factor. Even more importantly, the factors determining what every state receives do not include health needs or rewards to those states that are spending efficiently. In order to address this issue, we present some estimations that analyze the determinants of FASSA. Surprisingly, we find that the money spent by the federal government in each state in 1997, that is, the year before the reform was

[5] The non-insured is the fraction of the population that is not covered by an insurance mechanism; however they can access health care services at less than full-cost prices in Ministry of Health and state health facilities (OECD, 2005, pp. 29 and 30).

implemented, is the strongest predictor of what each state receives from the FASSA in any given year. We also found that health outcome variables, like infant mortality rate and deaths by infectious and parasitic diseases, do not show steady or significant coefficients. Medical resources are, in general, statistically insignificant, contrary to what the formula of FASSA stipulates. Population is the variable that more consistently shows a negative sign. We also perform similar regressions to look at the determinants of the non-insured health expenditure made by the federal government (Ramo 12) before the reform. The results are very similar to the FASSA regressions and we conclude that the most important determinant driving health expenditure is the expenditure made in prior to decentralization.

The second part of our empirical strategy studies whether transferring resources from the federal government to states, as it happened with the decentralization process of 1997, has an effect on the infant mortality rate. For this purpose we rely on different empirical exercises. We first compare FASSA to Ramo 12 (the federal budget on health) by estimating the effect each budget had over infant mortality rate for the years after the reform and for the years before the reform, respectively. This allows us to make a comparison between how state governments performed between 1998 and 2003 relative to how the federal government did between 1993 and 1997. The former exercise is an important comparison because the decentralization reform consisted in transfers of resources and responsibilities from the federal to state governments. We found no significant difference in the efficiency of Ramo 12 and FASSA. Perhaps one reason we did not find a significant effect is that some states did very well whereas others underperformed, washing out gains when averaging across states. Thus, in our second set of estimates, we test whether states that received more FASSA resources observed better health outcomes than low FASSA states when comparing the years after the reform with the years before the reform. Again, we found no significant difference between the high FASSA group relative to the low FASSA group. In another

set of estimations, we find that the fetal death[6] rate among the non-insured population did not have a significant change after 1997 when compared to the fetal death rate in the insured population. However, for the fetal death rate, if we compare the expenditure efficiency (as measured by the effect of health expenditure increases on the infant mortality rate) of both FASSA and Ramo 12 with that of health expenditure for the insured population, we found that the former became more efficient after the decentralization reform. In conclusion, except for the last specification, the evidence suggests that the decentralization of the health sector did not have an effect on the well-being of the population.

The contribution of this paper is multifold. The first two are empirical ones. In the first place, this is the first work that evaluates empirically the effects of decentralizing the health sector in Mexico as well as the determinants of the distribution of health funds across states. Second, to the best of our knowledge, this paper is the only one that compares the efficiency in the provision of health services between the federal and state governments in two different federalist settings: centralized and decentralized. The second two contributions are related to the methodology. First, our identification strategy allows us to overcome some problems of endogeneity between decentralization and health outcomes, an issue seldom discussed in the literature. Finally, our measure of health decentralization is the actual health expenditure made by the state governments (from federal transfers), which, we consider, is a cleaner way to analyze efficiency issues relative to previous literature.

The results of the present work may give important lessons about the conditions under which fiscal decentralization maximizes its impact on people´s welfare. We argue that successful decentralization may be related to some necessary conditions: revenue collection decentralization, the strengthening of transparency and accountability of state governments, and improving institutional checks and balances.

[6] In this case, we did not use the infant mortality rate because it is not possible to distinguish between non-insured and insured population. Due to the way fetal deaths are registered, it is possible to construct a fetal death rate for non-insured and insured population. The way we construct these rates is explained in detail in section V.

The structure of the paper is as follows. Next section reviews previous literature related to health decentralization making explicit what our contributions are. The third section discusses briefly some characteristics of the health system in Mexico and the evolution of the main health indicators in the last two decades. The fourth section presents a description of the process of health decentralization and an analysis of how FASSA is allocated between states. The fifth part describes our empirical strategy followed by the analysis of the effects of decentralization on the infant mortality and fetal death rates. Finally, the paper concludes by discussing some lessons and plausible explanations for the (lack of) results of decentralization.

II.Literature Review

Previous work on health decentralization has already pointed out the pros and cons of health provision by local state governments (see Asfaw et al. 2007 and Robalino et al. 2001 for a summary of these arguments). Among the advantages of decentralization are: a) local authorities may have access to better information on local circumstances, needs and preferences of citizens; b) information is used more promptly and cuts costs without procedures that require central authorization, thereby enabling a more flexible operation of local governments and; c) It can also promote transparency, accountability, efficiency and community´s participation. On the other hand, decentralization may hinder welfare gains due to: a) diseconomies of scale; b) lack of capacity, skills and information of local authorities on how to implement public policies; c) Inability to collect own revenue to provide public goods; d) lack of interest from local elites in community's needs (capture of rents if there is no transparency and accountability) and; e) additionally it might cause implementation and coordination problems with national policies across regions.

Notwithstanding the importance of the topic, the empirical evidence on the consequences of decentralization is scarce. In particular, for the case of the health sector, previous literature has found that a more decentralized health sector is

associated with a lower infant mortality rate,[7] results that are opposite to our findings. Countries covered in this literature include India (Asfaw et al., 2007), Argentina (Habibi et al., 2001), China (Uchimura and Jütting, 2007), Canada (Jiménez Rubio, 2011), Spain (Cantarero and Pascual, 2008), Colombia (Soto et al., 2011) and a cross country study (Robalino et al., 2001).

Nevertheless, this empirical research on the effects of decentralization has no yet provided compelling answers. First, it has had difficulties to find data on health spending by local governments. For instance, Asfaw et al. (2007), Robalino et al. (2001), Habibi et al. (2001), and Uchimura and Jütting (2007) use the proportion of total public expenditure or revenue that is spent or collected by provincial or sub-national governments as a measure of decentralization, even if such resources are used in different sectors from health. This indicator of decentralization clearly fails to deliver credible evidence about the real impact of decentralization in particular sectors, such as the health sector. It is common that countries differ in the spheres that are decentralized. For instance, a country may have high local fiscal autonomy in many spheres but health, or it may be that the only type of decentralized expenditure is health (see Jiménez Rubio, 2011), which may lead to an identification problem of the relationship between health decentralization and outcomes. Regarding this, the only works that tackle this issue are Jiménez Rubio (2011), Cantarero and Pascual (2008) and Soto et al. (2011) as they use a health specific decentralization indicator.

An additional issue of just using the percentage of health decentralized resources is that the estimations don´t control for the level of health expenditure. This may lead to obtain biased estimates due to omitted variable issues if the share of subnational resources is correlated to the level of health expenditure (in this regard

[7] Literature has shown that factors correlated to health status are total healthcare spending, lifestyle factors (tobacco and alcohol consumption, and diet), education, pollution and income (Joumard et al., 2008). In addition, Berger and Messer (2011) find that the percentage of population older than 65, inequality and the percentage of health expenditure financed by public are also important features related to health. In addition, Soares (2007) finds that access to water and sanitation was really important for the improvement of life expectancy in Brazilian municipalities between 1970 and 2000.

Jiménez Rubio, 2011 is an exception). In the absence of health expenditure in the econometric estimation, the results that find a negative relationship between decentralization and infant mortality rate may be capturing the effect of higher health expenditure (see, for instance, Joumard et al. (2008), which shows a positive effect of health expenditure on outcomes).[8]

Our paper solves both shortcomings using as measure of health decentralization the actual money spent by state governments in the health sector from transfers of the federal government, which represents a high portion of health expenditure for non-insured population (around 80% between 1997 and 2003).

Moreover, following Jiménez Rubio (2011), we consider it is important to control for other types of health expenditure (private, federal and social security institutions) that may be also driving health outcomes. The absence of these controls could confound the actual effect of greater local and state government's health expenditures. In order to deal with this issue the econometric estimation presented in Section V control for a variety of health expenditure or resources made by private and public institutions.

Methodologically, this paper deals with the issue of reverse causality between infant mortality rate and decentralization, a little discussed topic in the literature. An advantage of this paper is that, for the case of Mexico, there is little evidence to support the hypothesis that the state assignment of decentralized resources is driven by health status, which allows us to have a clean identification strategy.

Moreover, to the best of our knowledge, our paper distinguishes from previous literature as we evaluate the effects on health of a reform that decentralized health provision from the federal government to state government. Therefore, we directly explore whether health state provision had better effects than the provision made by the federal government before the reform. In other words, we depart from the existent literature on health decentralization (which explores whether the degree of

[8] See also Mosca (2003) and Akin et al. (2005), which study the determinants of local health expenditures in Switzerland and Uganda, respectively.

decentralization improves health outcomes) using a methodology that allows us to compare explicitly the performance of the health expenditure exercised by the federal government and state governments.

III. Mexican Health System

i. Health Institutions

The Mexican public health system is highly fragmented and health is provided by several institutions. Each institution is different in whether they provide care for the insured or non-insured population. "The insured receive care for free from providers belonging to their social insurance institution […][The] uninsured population, although not covered by an insurance mechanism, can still access health care services at markedly less than full-cost prices in publicly financed Ministry of Health and state health facilities" (OECD, 2005, pp. 29 and 30). Workers in the formal labor market workers and their families are covered by a set of social security institutions. Basically there are three types of public health insurance institutions: i) Social Security Mexican Institute (IMSS by its Spanish acronym) provides services to 40% of the population (salaried workers of the private formal labor market and their families); ii) Institute of Security and Social Services for Government Workers (ISSSTE) covers 9% of the population (federal government workers and some state workers); and iii) others, which include social security systems for the state-owned oil company (Petróleos Mexicanos, PEMEX) workers, the Navy, the Army, among others, which covers around 2% of the population. These institutions are financed through tripartite contributions by the federal government (subsidies), the employer institutions and employees. Each institution has and operates its own set of clinics and hospitals and employs salaried doctors. The provision of health services is mandatory and there are no cost sharing mechanisms (OECD, 2005).[9]

[9] Since 1995, non-insured population can also obtain Social Security coverage voluntarily through various programs such as "Health Insurance for the Family" (for self-employed individuals and employees in the informal sector) and Voluntary Incorporation to the Ordinary Regime (aimed for small businesses or independent workers, like family businesses, artisans, domestic workers, etc.).

The responsibility to provide health care coverage to those who do not have access to the social security system (less than half of the population) is shared by the MofH and the state health services. The rates charged (for those not registered at the Popular Insurance, see below) for health services depend on the income of the patient and varies among hospitals and states. The benefits include the provision of primary, secondary and tertiary care[10], as well as preventive and curative services, but services are subject to the availability of resources. Besides the rates charged (a tiny portion of the non-insured expenditure) financing comes from the federal budget (Ramo 12[11] and FASSA) and states' own resources (Participaciones[12] and other own state income).

In order to improve the access of non-insured and poor people to basic health services numerous programs have been implemented. The first of such programs is IMSS-Oportunidades, which is operated by IMSS but is financed through budget allocations from the federal government. It is targeted to marginalized groups of rural areas with no access to any kind of services and it operates in 17 states (out of 31 states plus the Federal District). It provides outpatient and inpatient cares[13] and medicines. The program has its own IMSS-Oportunidades facilities and every member of the community where it has presence is eligible for this program. In 1996, the federal government (with joint resources from the World Bank) established the Coverage Extension Program (PAC by its Spanish acronym) to provide access to a basic package of

[10] Primary care refers to medical services offered by primary care provider who have the first contact with the patient. Treatments of illnesses or preventive care are given at this level. Secondary care is provided by medical specialists and their patients are referred by primary specialists. They provide specific expertise and procedures. Finally, tertiary care is provided by specialized hospitals (e.g. oncology, neonatology, nutrition, trauma, etc.) equipped with diagnostic and treatment facilities that usually are not available in other clinics or hospitals.

[11] Ramo 12 is the federal budget assigned to the provision of health services for the non-insured population. It includes the MofH budget, the health component of Oportunidades (an anti-poverty program based on conditional cash transfers), resources for public health programs and some resources for the Seguro Popular, the National Health Institutes and other large hospitals run by the federal government. IMSS-Oportunidades was previously financed through Ramo 12 but these resources were directly transferred to the IMSS budget.

[12] Participaciones are non-earmarked funds transferred from the federal government to states and local governments.

[13] A basic distinction is that inpatient care requires that patient is admitted to a hospital overnight for a longer treatment. If a patient receives treatment but is not admitted to a facility it is considered outpatient care.

13 interventions for rural, indigenous and highly marginalized population. Since 1993 the resources of PAC were transferred to the states as part of their federal allocations.

Oportunidades (different from IMSS-Oportunidades) is another income support program that contributes to improve access to health. It is administered by the federal Ministry of Social Development (SEDESOL) which aims to increase the human capital of the extremely poor focusing on three components: education, nutrition and health. This former element includes free access to the same basic package interventions as PAC in IMSS-Oportunidades and State Health Services facilities (OECD, 2005).

Since 2004, the non-insured population can enroll in the public health insurance program called Popular Insurance (Seguro Popular), which is administered by the MofH. It is financed through tripartite contributions: i) a social quota from the federal government budget; ii) a federal + state contribution; and iii) contributions from families, which depend on their income level. The benefits are primary, secondary and certain high-cost tertiary care interventions. There is no cost sharing, it is voluntary and the objective is to reach universal coverage. It was fully implemented in 2004.

Finally, a minority of the population (around 3%) has private health insurance (half are financed by employers), which can be deduced from taxable income. There are two main types of private health policies: more than 97% of the private insured population is covered through the catastrophic medical insurance policies (*gastos médicos mayores*) for hospital expenses and various treatments for defined diagnoses; the remaining 3% of the private insured population has coverage through Products by Specialized Health Insurance Institutions (ISES), which is a "health care system that assumes or shares both the financial risks and delivery risks associated with providing comprehensive medical services to insured, usually in return for a fixed, prepaid fee" (OECD, 2005, p. 39). It offers full health coverage through contracting private providers.

ii. Health Financing: Amounts and evolution

Mexico spent 6.4% of its GDP in health in 2009, up from 3.1% in 1990. 48% percent of the financing of the Mexican health system is public (up from 40% in 1990). [14] As Figure 1 shows, the per capita public health effort more than doubled between 1990 and 2008. However, total and public expenditure in health is still far below OECD countries, which, in average spent 8.9 percent of GDP in 2008, which is mostly financed by the public sector (72 percent). Actually, Mexico is the OECD country that spends the least in health relative to the size of the economy.[15]

Covering around half of population, social security institutions (includes only IMSS, ISSSTE and PEMEX) were responsible of more than 80% of the public health expenditure in 1993 and around two thirds in 2003 (see Table 1 and 2).[16] In 1993, Ramo 12 represented to 13.02% of the overall public expenditure on health (0.33% of GDP)[17] and in 2003 its participation decreased to 9.17% of total health expenditure (0.26% of GDP). While state governments (without FASSA)[18] had a share of around 5% of health public expenditure[19] in 2003, FASSA represented about 16.8% of the public health expenditure (0.47% of GDP).

The growth in public health expenditure came along with a deeper penetration of health services in Mexico. Coverage has improved in the last years, as physicians per 1000 people went from 1.06 in 1990 to 1.44 in 2003 and nurses per 1000 passed from

[14] Private health expenditure is mostly (92.3%) done in the form of out-of-pocket payments. Within out-of-pocket expenditures, only a minor fraction is due to public sector cost sharing schemes. Most of the out-of-pocket is spent in the private sector. Just to have a perspective, OECD countries spend around 18.9% of the total expenditure in out-of-pocket payments, versus almost 50% in Mexico

[15] In per capital terms, Mexico´s health expenditure was of 852 PPP dollars in 2008 (only marginally above Turkey), which equals only one third of the OECD average (2972 PPP dollars). On the other hand, Mexico´s public effort in health provision is only comparable to the one made by the United States (47%).

[16] With the introduction of the Popular Insurance, social security expenditure dropped its share to 57% in 2009.

[17] For the calculations before 1998 is noteworthy that there is no available data for state governments' expenditure.

[18] Those resources come from own state resources and non-earmarked transfers from Federation to states.

[19] State governments made an effort equivalent to 8 per cent of the all public sector effort in 2008.

1.55 to 1.76 between 1990 and 2003 (Table 3 and Figure 2). Medical consultations also showed an important increase: in 1990, there were 1195 consultations per 1000 population; 13 years later, this indicator grew to 1726. Although these numbers show improvements since the last decade, Mexico still has one of the lowest health coverage among OECD countries.[20]

The expansion in health resources was translated into important progresses in health status in the last twenty years. For instance, life expectancy at birth in 2008 was 75 years, up from 70 years old in 1990; child mortality rate went from 39 deaths per 1000 live births (see Figure 1) in 1990 to 15.2 deaths per 1000 live births. As Table 4 shows, most of the progresses in this ground happened during the 1990s and first years of the new millennium. By 2003 life expectation was already 74 years old and infant mortality rate was 18. Other indicators of health status have shown important improvements as shown in Table 4. As these data suggest, Mexico experienced great improvements in health but there is still some catch up to do to OECD countries.[21]

Historically, regional differences in health indicators have been important but the progress observed in the last years favored poor states as they have closed the gap. For instance, as Figure 3 shows, the state with the highest infant mortality rate in 1990 was Chiapas with 60.72 and Federal District had the lowest (22.36). Thirteen years later, Guerrero had the highest infant mortality rate (25.89) and Nuevo León the lowest (12.44). The coefficient of variation for this variable dropped from 0.23 to 0.18 in a 13 years span. Table 4 also shows other variables having the same trend in the period we study. Table 1, 2 and 3 also show that convergence has happened in terms of public health expenditure (as percentage of GDP and per capita) and health resources. However, the gap between the poorest and riches states is important.

[20] According to OECD data, Mexico had 2 doctors per 1000 population in 2008 and the OECD average was 3. In terms of nurses per 1000 population averaged almost 9 in the OECD countries; Mexico had 2.4 nurses per 1000 population. Finally, doctor consultations per capita in Mexico were 2.8 compared to 7.1 among OECD countries.

[21] OECD life expectancy is 79 years old and infant mortality rate is 4.6 deaths per 1000 live births.

In spite of the recent achievements in health, Mexico still faces important challenges (OECD, 2005). The government has limited economic resources to deal with the demographic and epidemiological (from infectious to degenerative diseases) transition that will increase the demand for health care in the near future. An institutional reform is needed to avoid the current fragmentation of the various social security structures which has led to inefficient provision of health care. Also, issues of resources allocation in different dimensions must be faced. This is because there are important inequalities in health expenditures: across states, between social security institutions and non-insured population, and between federal and state governments. Moreover, it is important to minimize the out-of-pocket expenditure and increase the investment in infrastructure and equipment in the sector (Gómez Dantés and Ortiz, 2004).

IV. Decentralization and FASSA

i. Evolution of Health Decentralization in Mexico

In the last three decades, Mexico undertook two processes of health decentralization mainly for the coverage of non-insured population. The first wave happened in the 1980s but it was not generalized since only 14 states[22] signed the agreement with the federal government. Although the program included the transfer of responsibilities to states for the operation of some hospitals and administrative tasks and the integration of the services provided by IMSS-Coplamar[23] and the MofH, the spending decisions, regulation and policy formulation remained controlled by the MofH (see Cabrero and Martínez Vázquez, 2000 and Merino, 2003). Moreover, the provision of health services and health outcomes from this attempt of decentralization were not different between

[22] Tlaxcala, Nuevo León, Guerrero, Jalisco, Baja California Sur, Morelos, Tabasco, Querétaro, Sonora, Colima, Estado de México, Guanajuato, Aguascalientes and Quintana Roo. Note that, on average, these states are more industrialized, have less population dispersions, and problems of nutrition, health and education.

[23] COPLAMAR stands for "Coordinación General del Plan Nacional de Zonas Deprimidas y Grupos Marginados", one of the social programs implemented in the seventies.

the signers and non-signers of the health decentralization agreement of the 80´s(Birn, 1999).

After some minor decentralizing actions during the administration of President Salinas (1988-1994) (see Merino, 2003), a comprehensive decentralization reform was launched in 1996 as part of an important strategy of the Health Sector Reform Program 1995-2000. Centralism in the sector was seen as a cause of several problems such as low efficiency in the allocation of resources; lack of clarity in the responsibilities of each tier of government, excessive bureaucracy, inertia and inequality in the distribution of resources among states and absence of coordination between IMSS-Solidaridad,[24] MofH and state health authorities (Merino, 2003). In order to tackle these issues, the reform defined clearly the health concurrence of federal and state governments,[25] and the federal government transferred operative functions, along with health human, physical and economic resources to states, thereby providing them with greater autonomy. Former employees of the federal MofH became part of the state administration. Although the reform of the 1990s was deeper than the one implemented in the 1980s, Merino (2003) argues that the implementation of health decentralization was uniform across states without taking into account differences in administrative capacity, willingness to take the transfer of responsibilities or states characteristics of population, services and geography, among others.

In order to meet their new responsibilities, states were endowed with FASSA, a fund that was created along with others in the context of a federalist reform in 1997. FASSA is a fund that transfers federal resources to states for health provision; it must be spent exclusively on health services for the non-insured population. FASSA represents the main source of financing for states as 77% and 64% of the state´s health expenditure

[24] Poverty program implemented during the Presidency of Salinas (1988-1994)

[25] Articles 3rd, 13th and 18th of the Health Law establish the responsibilities of both levels of governments. In short, states are in charge of the organization and operation of health establishments and services, prevention of contagious diseases, maternity child care, nutrition, visual and auditive health, among others. Federation, in turn, operates most of the secondary and tertiary hospitals, designs health regulation and policies, watches the use of economic resources, deals with labor relations of the non-insured system, and takes mayor investment decisions.

came from this federal fund in 1998 and 2009, respectively.[26] Although FASSA is distributed among states according to criteria such as health infrastructure, health service workers, the budget assigned the previous year and a component that is aimed to equalize health accessibility,[27] the law does not set the weight of each component neither the total amount allocated to the fund. Hence, the law does not establish a clear criterion for its distribution, allowing discretionary decisions by legislators and the federal government. Further, the resources obtained by every state are based on the amount agreed on originally between the federal government and states (Ortega, 2004), which depended on the expenditure made by the Ministry of Health before decentralization (Merino, 2003).

In fact, FASSA allocation between states in its first year of operation (1998) was very similar to the allocation of the MofH budget in 1997 and during the first years of the reform, federal expenditure to states was reduced considerably (see Figure 4 and Figure 5). In 1997 MofH distributed resources to states equivalent to 0.34% of GDP while in 1998 the number dropped to 0.02% with 14 states not receiving any resources. FASSA budget in 1998 was equal to 0.39% of GDP. As shown in subsequent sections that the MofH budget for each state in 1997 is a good predictor of FASSA in any given year, suggesting that the fund has a strong inertial component.[28]

ii. What explains FASSA allocation among states?

In this section we provide some empirical evidence about the determinants of non-insured expenditure allocation among states (Ramo 12 before 1998 and FASSA after

[26] Merino (2003) considers that the high dependence of states on transfers is not optimal for health provision as they have little flexibility to make adjustments to respond to their needs. Moreover, states may limit their health expenditures if they believe that a higher effort would be seen as a lower need for resources and thus less transfers from the federal government. .

[27] This component receives the remaining of the total budget of FASSA, which represents a low share. For instance, in 2001 its allocation was of only 100 million pesos when the overall FASSA budget was around 25,000 million pesos. The distribution of the equalitarian component among states has a formula established in the Law and depends on non-insured population, mortality, marginalization and federal budget (article 31 of the Fiscal Coordination Law). This is the only formula for FASSA in the Law.

[28] After 2004, the nature of FASSA changed because it was used by the federal government to finance the operation of the Popular Insurance under different expenditure rules. For this reason the analysis of this paper stops in that year.

1997). First, we will present the descriptive statistics of this exercise and then we proceed to the description of the empirical strategy and its results.

Descriptive statistics

Table 5 shows the descriptive statistics for the two set of regressions: Ramo 12 (1993-1997) and FASSA (1998-2003) in per capita terms. We use lagged covariates by one year because health budget is allocated by the end of the previous year when legislators approve the federal budget.

The dependent variables, Ramo 12 and FASSA are on average 279 and 438 pesos per person, respectively (see Table 5). The potential explanatory variables for the non-insured population are some proxies for health needs, resources and socioeconomic variables. First, we include the infant mortality rate (the sample average is of 27.6 and 19.6 deaths of children younger than 1 year per 1000 live births in the pre and post reform years) and the infectious and parasitic mortality rate (0.25 and 0.2 deaths per 1000 inhabitants, respectively).[29] Second, according the Law of Fiscal Coordination, FASSA allocation should be partly determined by the physical and medical infrastructure available in each state. In order to control for these elements, we include total number of doctors assigned for non-insured population in each state (1.36 and 1.41 doctors per one thousand non-insured individuals before and after 1998).[30] Third, we also include socioeconomic variables such as the annual gross state product per capita (66.1 and 76.4 thousands of pesos as of December of 2010); the ratio of the non-insured

[29] During the process of collecting the data, we also collected other variables like deaths by maternal causes, fetal deaths, deaths by conditions originated in the perinatal period, deaths by diabetes, and deaths by nutritional deficiencies, among others. We do not include these variables as regressors because many of them are highly correlated. However, the results are robust to the use of one specific variable instead of another.

[30] We also try other specifications including the number of non-insured medical offices and appointments; number of dentists, number of nurses and number of hospital beds of the Ministry of Health. As before, we do not include these variables as regressors because many of them are highly correlated. However, the results are robust to the inclusion of one of these variables instead of the one included in the specification.

population over the total population (47 and 50%), and total population (2.9 and 3.1 millions).[31]

Finally, according to the Law of Fiscal Coordination, the allocation of FASSA also depends on what each state received in the previous year. In fact, when the FASSA started to operate, the allocation of such resources among states crucially depended on what the federal government directly spent on each state in 1997 through centralized resources, i.e., Ramo 12. This means that as of today, the allocation of FASSA between states still depends on what each state received in 1997 from Ramo 12. For this reason, we add as a regressor the amount of resources that each state received in 1997 through Ramo 12. On average this variable is 311 pesos per capita. Following the same logic in Ramo 12 per capita regressions, we include Ramo12 per capita in 1992 (the state average of this variable was of 254 pesos per capita).

Health Expenditure 1993-2003

Our empirical strategy in this section intends to explore what the determinants are for the distribution of non-insured health expenditure among states: Ramo 12 for the previous years of the reform of 1997 and FASSA for the 1998-2003 period in order to check if there was a change in the criteria of assignation once the decentralization took place.

For each period (before and after 1997), we run two sets of regressions. The first one is a pooled data approach, in which we regress per capita FASSA (and Ramo 12) flows received by state i in year t in constant pesos, on a set of covariates that presumably determines the amount of resources that each state receives in a specific year. We include year dummies to the specification to control for aggregate time effects. In this estimation, we add a time-invariant regressor: the federal budget on health in 1997 (in 1992 for Ramo 12 specifications) because we want to see how important this inertial component is for FASSA allocation, as some authors have

[31] Education was also included in some specifications but the results were unaltered.

suggested. We also include a state fixed effects estimations (removing the Ramo 12 per capita component) in order to check whether the estimations are consistent. The second set of estimations are cross section regressions for 1998 and 2003 (results are consistent for the rest of the years) as we are interested to see the year basis criteria of the Federal Congress in the assignment of FASSA.

We also run a similar set of regressions for the Ramo 12 per capita before the reform (between 1993 and 1997). The justification is that Ramo 12 in 1997 is a powerful determinant of FASSA allocation in the following years. So, we want to understand if Ramo 12 per capita is correlated to other variables that indirectly could be determining FASSA.

Results

The results for the determinants of FASSA and Ramo 12 per capita are shown in Table 6. For columns (1) and (7), which only include year dummies and our workhorse set of controls, the interpretation of the coefficients is as follows. For every 1000 pesos per capita states received in transfers under Ramo 12 in 1997 (1992), it gets under FASSA (still Ramo12 in 1997) 1329 (963) pesos on average in the period 1998-2003 (1993-1997). The effect is statistically significant at 1% level. This means that in fact whatever each state received in 1997 and 1992 by Ramo12 is the main determinant of the amount each state receive from FASSA (after 1997) and Ramo 12 (after 1997) in any given year.

This result remains unchanged in cross section regressions as specifications 3, 5, 9 and 11 show as the inertial component is crucial to understand the allocation of health public expenditure for non-insured population. Probably this result should not be a surprise because there is persistence on health outcomes and resources over time and the initial allocation of expenditure may be picking the effect of initial outcomes. However, we believe that health outcomes (such as infant mortality rate) should matter independently in how health expenditure is allocated. In this sense, we do not find consistency in the signs and significance of the different potential explanatory variables (even though they are explicitly contained in the formula of FASSA) across the different

regressions. This leads us to suggest that legislators assign health budget exclusively taking into account the previous allocation and no other health fundamentals. The only variable that seems to be consistent in the significance and magnitude is population. The sign is negative; implying that more populous states obtained lower health transfers. It could be thought that this sign is due to its correlation with other variables. For instance, it is plausible that a state with high mortality has restricted access to health facilities that are negatively correlated to population density. However, discarding population as an explanatory variable does not change our results.

In particular, infant mortality rate and infectious and parasitic mortality rate yield no significant estimates in most of the cases. In few specifications they even have an opposite expected sign as it is negative. The result would indicate that states with more health need would receive fewer resources from FASSA, suggesting a regressive scheme of distribution of health budget.

With respect to the variable related to medical infrastructure (number of doctors by the Ministry of Health per non-insured population), the coefficient is positive for Ramo 12 per capita but only the regressions for 1997 (columns 5 and 6) are significant. Interestingly, for FASSA per capita regressions without Ramo 12 per capita for 1997 included, the results are positive and significant for the fixed effects and 2003 regressions (columns 8 and 12), which could be related to the FASSA allocation formula stated in the Law of Fiscal Coordination,

Finally, in a few specifications, state GDP shows a negative and significant coefficient, indicating that there is some redistributive element in FASSA. However, this result is not consistent across the different specifications. It is surprising that the proportion of non-insured population is not significant because it is precisely the population that it should be targeted by non-insured expenditure (either Ramo 12 or FASSA).

In sum, the results indicate that health outcomes (and other variables) do not determine how the resources are allocated. Our regressions suggest that the most

important determinant of state non-insured expenditure is the past allocation. This finding is critical for our empirical strategy for the consequences of decentralization, as we do not have any evidence that FASSA is endogenously allocated in function of health outcomes. So we are confident that, in particular, infant mortality rate is exogenous of how FASSA is determined (see Figure 6).

V. Does decentralization of resources for health services improve state-level health outcomes?

In this section we test, through different estimation procedures and specifications, whether the decentralization of resources for health services improve state-level health outcomes. First, we test whether state health outcomes improved in the years after the implementation of FASSA relative to how Ramo 12 did in the years previous the reform. This is an important comparison because the decentralization reform consisted of a transfer of resources and responsibilities from the federal government to the state governments. We found no significant difference between the effectiveness of Ramo 12 and FASSA. Second, we test whether states that received more FASSA resources observed better health outcomes than low FASSA states after the reform. Again, we found no significant difference. Third, we test whether there is a difference between state health outcomes of the uninsured relative to the insured population after the implementation of the reform. Since Ramo 12 and FASSA focus on the non-insured population, we took the insured population as a control group. We found, as before, no significant difference between health improvements observed after the implementation of the reform among the treatment and control groups. Finally, focusing on expenditure amounts, we test whether the effectiveness of FASSA and Ramo 12, which focus on the non-insured population, between the years before the reform (1993-1997) and the years after the reform was implemented (1998-2003) is more effective than the health expenditure for the insured population. Contrary to all previous results, we found that in fact FASSA and Ramo 12 together are more effective than the IMSS, ISSSTE or PEMEX at reducing fetal deaths.

i. Summary statistics

Before presenting the results, we briefly summarize the main variables used in this section. In Table 7 we show the summary statistics of the variables used by pooling the data from 1993 through 2003. The definition, corresponding acronym, units of measure and source for each of these variables is included in Table 8. We follow the literature using as our preferred health status variable, infant mortality rate, denoted $\mathrm{IMR_{it}}$ (deaths of babies younger than 1 year old divided by life births). According to summary statistics, the natural log of IMR_{it} is on average 3.11, that is, approximately 22 infant deaths per thousand births among all states and years. There are various reasons we focus on $\mathrm{IMR_{it}}$ as our main dependent variable. Infant mortality rate is a good health outcome measure as it reflects health attention to sensitive care groups of population (children and pregnant women); it is also known that it responds rapidly to changes in the health systems (Jiménez Rubio, 2011); it is better measured than other indicators such as life expectancy; and is correlated with many other health indicators (Joumard et al., 2008; and Jiménez Rubio, 2011). The other variable we use as measure of state health status is total fetal death rate. As shown in Table 7, the natural log of total fetal deaths averages -1.470, that is, about 0.26 fetal deaths per thousand individuals. The main advantage of this variable relative to IMR_{it} is that we can obtain the fetal death rate for non-insured and insured population, respectively. According to summary statistics, for the non-insured population fetal death rate averages around 0.30 fetal deaths per thousand non-insured individuals. For insured population, there are on average 0.22 fetal deaths per thousand insured persons.

Continuing with the variables summarized in Table 7, $\mathrm{Ramo\ 12_{it}}$ is on average 190 pesos per capita between 1993 and 2003. The variable $\mathrm{FASSA_{it}}$ averages 438 pesos per capita for the years after its implementation (see Table 5). Gross state product per capita (GSP_{it}) in constant pesos is on average 71,707 pesos. Population density is around 266 persons per squared kilometer on average. The average expenditure by IMSS, ISSSTE and Pemex is 2663 pesos per eligible person $(HEEP_{it})$. The proportion of

uninsured population over the total population per state is on average 0.49. The primary school completion rate, another measure of schooling, $PSCR_{it}$, is on average 85 percent. We do not observe the out-of-pocket expenditure on health services by the population for years before 1998. However, on average, there are 0.29 hospital beds in the private sector per 1000 inhabitants $(HBPS_{it})$.

ii. What was the impact on state health outcomes of FASSA relative to Ramo 12?

In this section we test whether state health outcomes improved in the years after the implementation of FASSA relative to how Ramo 12 did in the years previous the reform. This is a way to test whether decentralizing resources from the federal to the state government improved the health of the population. Recall that before 1998 the resources for health services were channeled through Ramo 12 and the federal government was responsible of their use in each state. After 1997, FASSA was created to channel those same health resources to states and now state governments are responsible of the administration of such budget. The empirical specification is the following:

$$IMR_{it} = \alpha + \beta_1 I(t > 1997) + \beta_2 (Ramo\ 12_{it}) + \beta_3 [I(t > 1997) * (Ramo\ 12_{it})] + \beta_4 [I(t > 1997) * (FASSA_{it})] + \mathbb{X}_{it} B_5 + c_i + u_{it} \quad (1)$$

$$i = 1 \dots 32, \qquad t = 1, \dots 11$$

In equation (1), IMR_{it} is the natural logarithm of the infant mortality rate in state i and year t; $I(t > 1997)$ is an indicator function that takes value zero for the years before the reform was implemented and one after the reform; $Ramo\ 12_{it}$ is the amount of resources per capita directly spent by the federal government for health services in state i and year t; $FASSA_{it}$ is the amount of decentralized resources per capita for health services provision in state i and year t after 1997; $\mathbb{X}_{it}$ refers to a vector of control variables which are described below; c_i denotes the state fixed effect which is assumed to be arbitrarily correlated with the regressors; and u_{it} denotes the idiosyncratic error for state i in year t. There are 32 states in Mexico and the analysis covers eleven years, from 1993 through 2003.

Notice that $FASSA_{it}$ enters only as an interaction with the reform-years indicator, i.e. $I(t > 1997)$. This is because FASSA was implemented in 1998 and thus it takes value zero for years before 1998. In contrast, $Ramo\ 12_{it}$ operates both before and after the decentralization reform. $Ramo\ 12_{it}$ appears by itself and as interaction with the reform-years indicator. Also, notice that β_2 is the effect of $Ramo\ 12_{it}$ over the IMR_{it} in the years before the reform and β_4 is the effect of $\mathrm{FASSA_{it}}$ on the IMR_{it} in the years after the reform. Thus, our interest is in $\beta_4 - \beta_2$. We expect this difference to be negative. However, we also need this difference to be significant to be able to conclude that the decentralization improved health outcome of the population. If $\beta_4 - \beta_2$ turns out to be not significant, even if it has the correct sign, it implies that there is no significant difference between what central government was doing with the money and what state governments do with the same resources.

Equation (1) also permits us to test whether the money spent on health services by state governments improves the well-being of the population relative to the money spent by the federal government for the same purpose but considering both effects in the years after 1997, that is, after the decentralization reform took place. In this case our interest is in $\beta_4 - (\beta_2 + \beta_3)$. If it this difference is negative it implies that FASSA is more efficient than Ramo 12. However, regardless of the sign, if $\beta_4 - (\beta_2 + \beta_3)$ is not significant, we can only say that there is no difference between the two funds after the reform.

There are other variables besides $FASSA_{it}$ and $Ramo\ 12_{it}$ that could explain the IMR_{it}. For this reason, we include different control variables in the specification equation ($\mathbb{X}_{it}$). We include gross state product per capita (GSP_{it}) to control for level of income. We also try to control for the average distance between health facilities and the inhabitants by including population density (PD_{it}) as control variable. As mentioned above, there are three main public institutions in charge of providing health services to eligible population: IMSS, ISSSTE and PEMEX. The expenditures made by these institutions could also be contributing to the decrease of the IMR_{it}. We added the

expenditure made by these institutions in health services provision per insured person and name the variable $HEEP_{it}$. Another control variable we include is percentage of uninsured population (PUP_{it}) in each state and in each year. This variable is a proxy of the necessities of health services in each state. We control for the primary school completion rate per state, $PSCR_{it}$, as a measure of schooling. Finally, we do not observe the out-of-pocket expenditure on health services by the population for years before 1998 and sure these expenses could also be improving the health outcomes of the population. Therefore, we proxy this variable with the number of hospital beds per 1000 inhabitants in the private health sector, i.e. $HBPS_{it}$.

We estimated equation (1) by fixed-effects panel estimation method, correcting standard errors for cluster effects of states.

Results from estimating equation (1) are in Table 9. The second column contains the estimates of the coefficients of specification (1) with fixed effects but without control variables.[32] Results indicate that an increase by one thousand pesos per capita in $FASSA_{it}$ decreases IMR_{it} in 39.4% whereas an increase by the same amount in $Ramo\ 12_{it}$ before 1997 decreased IMR_{it} in 33.7% (and both effects are statistically significant at the 1% level). Recall that average $FASSA_{it}$ is 438 pesos, thus if it increases to 1438, an increase of 228%, the infant mortality decreases 39.4%. For the case of $Ramo\ 12_{it}$, an increase from its average of 278 pesos per capita between 1993 and 1998 to 1278 pesos, a 1000 pesos increase or a 359% increase, the infant mortality decreases by 33.7%. The difference between the two semi-elasticities is $\beta_4 - \beta_2 = -0.394 - (0.337) = -0.057$, but not statistically significant. This implies that $FASSA_{it}$ fares no better than $Ramo\ 12_{it}$.

In column (3) we estimate the same specification as before but we added control variables. Results are similar as those in column (2), that is, there is no significant

[32] Results in column (1) were included to compare the R^2 from equation (1) without including fixed effects and when including such effects. In such case the R^2 is 0.474. We also regress IMR on time dummies only and on fixed effects only. The corresponding R^2's are 0.539 and 0.452, respectively.

difference between how $\text{Ramo } 12_{\text{it}}$ did before the decentralization reform and how $FASSA_{it}$ did after its implementation. However, the difference is positive and equal to 0.0129, which implies that the semi-elasticity related to $FASSA_{it}$ is 1 percentage points higher than the corresponding for $Ramo\ 12_{it}$. In column (4) and (5) we show the results from estimating equation (1) when we include a time trend and year indicators, respectively. In both cases, $\beta_4 - \beta_2$ is negative, as expected, though not statistically different from zero. Notice that increasing $Ramo\ 12_{it}$ and $FASSA_{it}$ by 1000 pesos decreases the IMR_{it} by 1.8% and 6.8% respectively, but neither coefficient is statistically significant (column 5).

Using the results in Table 9, we also compare $Ramo\ 12_{it}$ and $FASSA_{it}$ with each other but in the years after the reform. In other words, we test whether $\beta_4 - (\beta_2 + \beta_3)$ is different from zero. In all five columns, except for column (4), it is the case that $FASSA_{it}$ is not significantly different from $Ramo\ 12_{it}$ after the reform was implemented. However, notice that such difference is negative in all five cases. According to results in column (5), when we added year indicators and control variables, the difference is 0.064 which implies that $FASSA_{it}$ decreases IMR_{it} relative to $Ramo\ 12_{it}$ when comparing them after 1998.

From Table 9 it is also possible to compare $Ramo\ 12_{it}$ performance in the years after the reform with the years before the reform, coefficient β_3. This coefficient is positive in all four columns, but fails to be statistically significant. This implies that $Ramo\ 12_{it}$ is less efficient nowadays than before. In accordance to column (5), the coefficient is 0.014. This means that one thousand pesos increase in $Ramo\ 12_{it}$ after the reform took place decreases in 1.42% the IMR_{it} compared to the effect of $Ramo\ 12_{it}$ in the years before the reform took place.

Finally, another coefficient of interest from Table 9, is the one associated to the decentralization reform, $I(t > 1997)$. Notice that in all five columns this coefficient is negative and statistically significant at 1% level. This coefficient is capturing the fact that

over time the IMR_{it} is decreasing between 1993-1997 and 1998-2003. The magnitude of the coefficient decreases when we include either a time trend or year fixed effects.

The results presented in Table 9 are robust to different measures of health well-being, specifically, infant mortality rate for children less than 5 years old, child deaths by respiratory diseases per 1000 births, child deaths by intestinal diseases per 1000 births, and fetal deaths by 1000 inhabitants.[33] Last column in Table 9 includes the results for estimation equation (1) using as the dependent variable the fetal death rate by 1000 inhabitants and notice that results hold, $\beta_4 - \beta_2$ is negative, although significant at 10% level.

iii. What was the impact of decentralization on health outcomes in states that received more resources from FASSA?

That previous results are not significant are evidence that in general decentralization of responsibilities and funds from federal to state authorities regarding state health services provision did not significantly improve the well-being of the population relative to how the federal government did before the reform. Although the sign of the coefficients of interest are negative, their magnitudes are rather small. However, perhaps states that received more resources from FASSA did a better job than states that received fewer resources.

In this section we follow a difference in difference approach which will enable us to address the following question: Did states that receive more FASSA resources get better health outcomes than low FASSA states after the reform? Ideally, we would like to have an experiment with one group of states that were treated with health decentralization and other set of control states that were not submitted to the institutional change, and compare the performance of both groups after the reform was implemented. However, as previously discussed, all states received FASSA funds. Thus, we perform a pseudo experiment. We divide the states into two groups according to

[33] These results, not reported to save space, are available from the authors upon request.

FASSA transfers per capita received in the first year of the reform (1998). [34] We called the first group high FASSA states[35] (or treated group) and are those that are above the median of the 32 states. The low FASSA states group (or control group) are the remaining states. We estimate a set of difference in difference regressions with the following simple framework:

$$IMR_{it} = \alpha + \beta_1(H_i) + \beta_2 I(t > 1997) + \beta_3[I(t > 1997) * (H_i)] + \mathbb{X}_{it}B_4 + c_i + u_{it} \quad (2)$$

$$i = 1 \dots 32, \qquad t = 1, \dots 11$$

In this specification the dependent variable refers to the natural log of the infant mortality rate; H_{it} is an indicator function that takes value of one if the state i belongs to the high FASSA group and zero if it belongs to the low FASSA group; $I(t > 1997)$ is also an indicator function that is zero for the years before the reform was implemented and one after the reform; and the variable multiplied by β_3 is an interaction term between the previous variables. This is the coefficient of interest because it is the difference in difference effect on health of the reform on the treated states (high FASSA) relative to the control group (low FASSA). $\mathbb{X}_{it}$ refers to the same vector of control variables as before; c_i denotes the state fixed effect which is assumed to be arbitrarily correlated with the regressors; and u_{it} denotes the idiosyncratic error for state i in year t. Also, in some specifications we also include state fixed effects, a time trend common for all states, and year fixed effects, just as before.

The interpretation of the coefficients of interest is as follows: α refers to the health indicator average of low FASSA group before the intervention; β_1 is the difference in the average of the dependent variable of the high and low FASSA groups before 1998; and β_2 is the change in the average for the control group (low FASSA) after

[34] The range of the distribution of FASSA per capita is high as the descriptive statistics point out. The median of FASSA per capita in 1998 was 332 pesos of 2010 and the mean was 350 pesos, with the maximum value being 997 pesos and the minimum 179 pesos. The coefficient of variation (standard deviation/mean) is 0.48. The average FASSA per capita for the high group is 458 pesos and for the low group is 242 pesos.

[35] Baja California Sur, Colima, Campeche, Quintana Roo, Guerrero, Nayarit, Aguascalientes, Durango, Tabasco, Sonora, Tlaxcala, Tamaulipas, Yucatán, Morelos, Chiapas and Querétaro.

the reform relative to the pre reform period. Finally, β_3 captures the difference of health indicator average between high and low FASSA state after the decentralization relative to the difference between high and low FASSA state in the years prior to decentralization. We expect this last coefficient to be negative, but also significant. If it turns out to be not significant, it implies that there is no difference between the control and treatment group due to the decentralization.

Before presenting our results, it is worth pointing out that our identification strategy requires that per capita FASSA assignment in 1998, and thus our classification of states according to FASSA, to be exogenous and not correlated to the error term conditioned on the variables included in the right hand side of equation (2). For instance, if FASSA is assigned to states according to their health indicators, that is, states with worse health indicators receive more FASSA, and then our classification of state according to FASSA would not be exogenous. Table 10 shows the average of both groups for a variety of health indicators and other controls in 1997, the previous year to the reform. Last column indicates the p-value for the t-test of differences in means between both groups. For the shown variables, it is not possible to reject the hypothesis that the difference in means is statistically different from zero. Given the classification of the groups and the persistency of FASSA per capita in function of the allocation of Ramo 12 per capita in 1997, it is not a surprise that both variables are the only ones that are significantly different from zero in the table at 1% level. This result suggests that the initial allocation of FASSA and its classification were not determined by health indicators, as one would expected.

Table 11 shows the results of the estimation for equation (2) between 1993 and 2003. The difference-in-difference coefficient (β_3) is negative but not significant in any of the regressions. Although the direction of the coefficient indicates that states receiving more FASSA had lower infant mortality rate after the reform than low FASSA states, this coefficient is statistically not different from zero. Thus, the results suggest that there is no a significant difference in health indicators between the treated and

control states after the reform relative to the years previous to the introduction of FASSA. The very small magnitude of the coefficient provides further assurance that decentralizing resources did not have an impact on health indicators for states which received more resources relative to those states who received fewer resources from FASSA. According to the results in column (4) which include control variables and a time trend, the coefficient associated to the high FASSA (β_1) states is negative and statistically significant, which implies that previous to the reform high FASSA states had a mortality rate 34% lower than lower FASSA state. This suggests that FASSA was assigned not accordingly to health necessities by states. Finally, β_2 is significantly negative (-0.080) reflecting the downward trend of infant mortality in control states.

The results presented in Table 11 are robust to different measures of health well-being, specifically, infant mortality rate for children less than 5 years old, child deaths by respiratory diseases per 1000 births, child deaths by intestinal diseases per 1000 births, and fetal deaths per 1000 inhabitants. Last column in Table 11 includes the results for estimation equation (1) using as the dependent variable the fetal death rate by 1000 inhabitants and results are very similar.

Results are also robust to excluding states around the median. For example, we pick only the 10 states with the highest and the 10 with the lowest FASSA and the results do not change (column (6) in Table 11). We also run the same specification with the top and bottom six FASSA states and results remain.[36]

iv. What was the impact of decentralization on the health outcomes of the non-insured population relative to the insured population?

So far we have not found evidence that health decentralization significantly improved the infant mortality rate, used as a proxy of the health conditions of the population. In this section we present two more empirical exercises. As mentioned before, all the states received FASSA funds, so in that sense, all states were treated, that

[36] Those results not shown in the paper are available upon request.

is, all states were affected by the reform. However, recall that FASSA and Ramo 12 have a target population, those who have no insurance. Thus there is a fraction of the population in each state that was not affected by the reform, namely, those who had already health coverage. Taking advantage of this fact, we perform two exercises in which we consider the non-insured population as the treatment group and the insured population as the control group. Under this assumption, we are able to compare the performance of both groups for the years before (1993-1997) and after (1998-2003) the reform was implemented.

To compare these groups we need to observe the infant mortality rate for each group. However, the official statistics do not include the IMR by insurance status, nor there is available data that permit us to construct the IMR for the insured and the uninsured population, respectively. Therefore, we rely on another health outcome: fetal deaths. This variable is part of *Estadísticas Vitales* published by INEGI. It is based on the information contained in Fetal Death Certificates. The main advantage of this variable is that it permits us to classify fetal deaths into our two groups of interest, according to whether the mother has insurance or not.

On the one hand, women who reported being beneficiary of either IMSS, ISSSTE, PEMEX, SEDENA, SEMAR or other institution are considered as insured. On the other hand, women who reported not having insurance are considered as non-insured.[37]

Using these data we construct the fetal deaths rate (FDR_{ijt}) defined as the number of fetal deaths occurred in state i, for group j, in year t as a fraction of the total population in state i which belongs to group j, in year t.[38] In this case, j is equal to 1 for the non-insured population and equal to 2 for the insured population. Another advantage of this health outcome is that, similar to IMR, it responds relatively quickly to improvements in health provision. Moreover, this measure continues to be closely

[37] Those who reported insurance institution as unknown or not specified were excluded from the estimation. Nevertheless, as we will see in the results, classifying this group as insured or non-insured makes no significant difference in the results.
[38] Please refer to Table 8 for its exact definition used in the estimations.

related to maternal health, one of the responsibilities transferred to states in the reform.

Nonetheless, FDR_{ijt} has one important problem. It tends to be biased because not all fetal deaths are reported to the corresponding authorities. Therefore not all fetal deaths have their corresponding certificate. This problem is more evident in poor, less educated and more disperse states, as well as states with a high proportion of uninsured population and less administrative capacity to register deaths. By controlling for some of these variables we take care for part of this bias. However, we do not observe other drivers of the bias. In order to control for this bias more generally we assume that the difference observed between two different measures of IMR, one biased (IMR_{Biased}) and one not (which corresponds to our IMR measure used along this study), is the same as the bias in our FDR measure. By including this difference as a regressor, we try to control for the FDR bias we observe.

In a first exercise, we analyze whether the non-insured population had greater improvements in health outcomes after decentralization relative to the insured population. The identification strategy behind this specification is that the health provision decentralization was implemented for the benefit of noninsured people, leaving insured people unaffected. We expect that non-insured population observed improvements in fetal death rate relative to the insured population after the reform.

Our identification strategy requires that the distribution of people between the uninsured and insured cohorts is exogenous, i.e., that insured population is almost the same as non-insured population but the treatment itself. There are many reasons we can think of that these two groups are not similar. However, Figure 7 graphs the national version of FDR_{ijt} per insurance eligibility group. As we would expect, insured population has a lower FDR than the one for non-insured population. Second, from the graph it is also clear that both groups had very similar trends, particularly in the years before the reform took place. This is perhaps enough for our difference in difference approach. After 1997, the insured population continued with no particular changes

whereas the non-insured population observed a small increase in 1998 to later show a steady decrease along the following years.

Another important assumption behind our identification strategy is that the composition of groups does not change over time, particularly as the result of decentralization. One problem could be that because of the decentralization, people would prefer to be not insured. However, the insurance status depends on whether the person works in the formal or informal sector. Therefore, most people do not choose whether to have insurance or not, but in which sector of the labor market to work. Moreover, in general, health services for non-insured people tend to be worse than health services for insured people.

We perform a difference in difference econometric approach with fixed effects. The equation to regress is as follows.

$$FDR_{ijt} = \alpha + \beta_1 T_{ij} + \beta_2 I(t > 1997) + \beta_3 \left[I(t > 1997) * (T_j) \right] + \mathbb{X}_{ijt} B_4 + c_i + u_{ijt} \qquad (3)$$

$$i = 1 \dots 32, \qquad j = Non - insured\ population,\ Insured\ population, \qquad t = 1, \dots 11$$

In this case, FDR_{ijt} is the natural log of the fetal death rate for state i, group j, in year t. T_{ij} is equal to one for the non-insured population in state i, and zero otherwise. Finally, $I(t > 1997)$ is defined as previously. Our interest focuses on the coefficient that accompanies the interaction of both previous variables, β_3. This coefficient is the difference in difference effect of the reform on FDR_{ijt} for the non-insured population relative to the control group, that is, the insured population. We expect this coefficient to be negative and significant. If it is only negative, but not significant, we cannot say that the reform had an impact that significantly affected the treatment group relative to the control group. As before, c_i denotes the state fixed effect which is assumed to be arbitrarily correlated with the regressors; and u_{it} denotes the idiosyncratic error for state i in year t.

The vector of control variables, $\mathbb{X}_{it}$, is the same as in previous exercises, except for two differences. First, total health from public institutions per capita, THE_{ijt}, is equal to FASSA and Ramo 12 expenditures for non-insured population, that is when $j = 1$, and equal to the sum of the health expenses by IMSS, ISSSTE and PEMEX for insured population ($j = 2$).[39] Second, since our dependent variable is most probably biased, we add $log(IMR) - log(IMR_{Biased})$ as an additional variable to control for the possible bias contained in the data.[40] As already mentioned, the assumption behind this inclusion is that the bias observed in FDR is the same as the bias observed in IMR. Our IMR measure does not have this problem because corresponding authorities already corrected the statistics from this bias. However, such bias can be observed at the national level, if we compare our measure of IMR, available at the Millennium Development Goals Statistics published by United Nations, and what we denote IMR_{Biased}, published by the Bureau of Health Statistics of Mexico, SINAIS (Figure 8). It is clear from the graph that the IMR_{Biased} is indeed seriously biased.

Results of the difference in difference regressions are shown in Table 12. The most important set of results are those in column (5). Columns from (1) to (4) were included to keep the table comparable with previous exercises. According to the results in column (5), which include year indicators and control variables, the coefficient β_3 is negative (-0.0269) but it is not significant. This result suggests that average FDR_{ijt} after the decentralization reform took place relative to previous years, is 0.026 lower for the treatment group relative to the control group, however, it is not statistically different from zero. According to the same set of results, β_1 suggests that fetal deaths rate for the non-insured is significantly higher (0.621) than the insured population in the years before the reform and the coefficient is statistically significant at 1% level. Moreover, β_2 suggests that the fetal deaths rate for the insured population decreased (-0.162) after

[39] We do not have data about health expenditure realized by other health institutions, for example, private institutions. Nevertheless, IMSS, ISSSTE and PEMEX provide health coverage to more than 95% of the insured population.
[40] Results are not significantly different if we do not include this difference as control variable. Results are available upon request.

the reform relative to previous years, and the coefficient is statistically significant at 5% level. In column (6) and (7) we run the same specification as in column (5); however, in column (6) we included those fetal deaths in which the insurance status was not specified in the insured population group, and in column (7) those fetal deaths were instead included in the non-insured population group. In both cases, β_3 is negative and not significant. These columns are included to check that omitting the unknown or unspecified insurance status fetal deaths makes no difference for our results. In conclusion, we found no significant difference between the non-insured and the insured population when comparing the mean FDR_{ijt} after the reform relative to previous years.

In a second exercise we continue exploiting our identification strategy and study whether there are differences in expenditure effectiveness for insured and non-insured population, respectively, after the reform was implemented relative to previous years.

Fortunately, we are able to measure the effectiveness of the expenditure for each of the two groups, because we also have detailed data on health expenditures made by various public health institutions. This information is summarized in the variable THE_{ijt} explained above. In equation notation this is variable is:

$$THE_{ijt} = \begin{cases} Ramo\ 12 + FASSA_{it} \ \ if\ j = Non - insured\ population \\ IMSS + ISSSTE + PEMEX_{it}\ if\ j = Insured\ population \end{cases}$$

Therefore, we study whether the change in the elasticity of FDR_{ijt} with respect to total health expenditure for the non-insured population between 1998-2003 and 1993-1997 is different from the change in the same elasticity for the insured population. The equation to estimate by fixed effects is the following:

$$\begin{gathered} FDR_{ijt} = \alpha + \beta_1 T_{ij} + \beta_2 I(t > 1997) \\ +\beta_3\left[I(t > 1997) * T_{ij}\right] + \beta_4 log\left(THE_{ijt}\right) + \beta_5\left[log\left(THE_{ijt}\right) * I(t > 1997)\right] \\ + \beta_6\left[log\left(THE_{ijt}\right) * T_{ij}\right] + \beta_7\left[log\left(THE_{ijt}\right) * I(t > 1997) * T_{ij}\right] + \mathbb{X}_{it} B_8 + c_i + u_{ijt} \end{gathered} \tag{4}$$

$$i = 1 \ldots 32, \qquad j = Non - insured\ population,\ Insured\ population, \qquad t = 1, \ldots 11$$

Equation (4) is just an extension of equation (3) where we interact $log(THE_{ijt})$ with the decentralization reform indicator, the treatment indicator and with both indicators together. As in previous exercise, FDR_{ijt} is the natural log of the fetal death rate for state i, group j, in year t; T_{ij} is equal to one for the non-insured population in state i, and zero otherwise; $\mathrm{I(t} > 1997)$ is decentralization reform indicator; c_i denotes the state fixed effect which is assumed to be arbitrarily correlated with the regressors; and u_{it} denotes the idiosyncratic error for state i in year t. The vector of control variables, $\mathbb{X}_{it}$, is the same as in previous exercise, that is, includes all controls discussed before plus THE_{ijt} and $\log(\mathrm{IMR}) - \log(\mathrm{IMR}_{\mathrm{Biased}})$.

In this case, the coefficient of interest is β_7. This coefficient compares the elasticity of the fetal death rate with respect to total health expenditure after the reform relative to years previous the reform for the non-insured population relative to the insured population. We expect this coefficient to be negative and significant. In other words, we expect health expenditure for non-insured population to have a greater impact in reducing fetal death rate after the reform relative to the control group.

Results for the difference in difference regressions are shown in Table 13. We again include columns (1) through (4) just to keep all tables comparable. However, the most important results are those in column (5). According to such results, which include control variables and year indicators, the coefficient β_7 is negative (-0.192) and significant at the 10% level. It implies that the difference in elasticities from 1998-2003 and 1993-1997 is 0.192 lower for the non-insured population relative to insured population. In other words, if health expenditure increases 1% for both groups and both periods, the FDR exhibits a larger fall by 0.19% for the non-insured population relative to the insured population. Contrary to our previous results, the health expenditure for the non-insured population, through Ramo 12 and FASSA, is significantly more effective after the reform took place than the health expenditure for the insured population.

This result can be explained by the fact that the elasticity of FDR with respect to THE did not improve for the insured group from 1993-1997 to 1998-2003, that is,

coefficient β_5 is 0.0322 and it is not statistically significant. This is in accordance with the implicit assumption that the insured population group was not affected by the decentralization reform. Moreover, for the non-insured group that same elasticity improved after the reform, i.e. $\beta_5 + \beta_7$, is -0.16 and it is statistically significant at 5% level. This is because the elasticity of FDR with respect to THE for the period 1998-2003 is 0.02 and not significant, whereas the same elasticity for the period 1998-2003 is 0.184 and statistically significant at 1% level (therefore, 0.18-0.02=-0.16). Although this implies that the reform did improve the health well-being of the population, notice that these elasticities are positive. In other words, increasing Ramo 12 before the reform by 1% increased the FDR by 0.18% and increasing Ramo12+FASSA by 1% for the years after the reform increased the FDR by 0.02% although we cannot distinguish this effect from zero. This is thus in accordance to our results from previous sections.

Just as in the previous exercise, column (6) and (7) are the same specification with the only difference being related to the dependent variable: in column (6) fetal death certificates with insurance status not specified were classified as in the insured population group; and in column (7) those same fetal deaths were classified in the non-insured population group. In both cases, β_7 is negative, however, it is not significantly different from zero in column (6). This is accordance to the hypothesis that those fetal deaths with unspecified insurance status are in fact non-insured because the magnitude of the coefficient β_7 in column (6) decreases sufficiently to become insignificant; and the magnitude of the same coefficient but in column (7) increases and becomes significant at 5% level. As before, these columns are included to check that omitting the unknown or unspecified insurance status fetal deaths makes no significant difference for our results.

VI. Conclusions

The results presented in this paper suggest that health decentralization in Mexico did not have the desired effects on state-level health outcomes. We did not find strong evidence that expenditure after the reform can explain improvements in health

indicators, such as the child mortality or the fetal death rates. In particular, we did not find that the effectiveness of FASSA expenditure was higher than the impact of Ramo 12 previous to the reform. Nevertheless, our exercises also suggest that the noninsured population had better outcomes derived from the reform than insured population. These results contrasts to what the policy makers that implemented the reform intended as well as what the classical theory of federalism would predict.

We believe that the results observed in Mexico may have obeyed to different factors that are worth exploring in future extensions of this paper. First, the reform was implemented from one year to the next and it is possible that states lacked the capacity to meet their new responsibilities immediately and neither were they able to administer the economic resources associated to health provision (Merino, 2003). The reforms may take some time in order to be effectively implemented as governments learn to operate and spend efficiently. A second hypothesis is that the institutional framework in which health was decentralized did not provide states with the incentives to provide better services to people. As we discussed in the text, the allocation of FASSA among states is rather unclear and it does not depend on the own state effort or health results. A merit-based system, in which future FASSA allocations depend on state´s own contributions and the efficiency with which each state used its resources in previous years, could have helped to boost the impact of health expenditure. In this sense, a study of the effects of the Popular Insurance (which is partially financed by FASSA) would contribute for the discussion as the rules and uses of decentralized resources for that program are better defined. A third explanation is related to checks and balances that states have when spending public resources, the capacity of the taxpayers to know how efficiently their money is being spent and the availability of mechanisms for accountability. We think that these three potential explanations are not exclusive and certainly complement the results of the paper.

VII. References

Akin, John; Paul Hutchinson and Koleman Strumpf (2005), "Decentralization and government provision of public goods: The public health sector in Uganda", *The Journal of Development Studies*, 41(8), pp. 1417-1443.

Asfaw, Abay; Klaus Frohberg; K.S. James and Johannes Jutting (2007), "Modeling the impact of fiscal decentralization on health outcomes: Empirical evidence from India", *Journal of Developing Areas*, 41(1), pp. 17-35.

Birn, Anne (1999), "Federalist flirtations: The politics and executions of health services decentralization for the non-insured population in Mexico, 1985-1995", *Journal of Public Health Policy*, 20(1), pp. 81-108.

Cabrero M. Enrique and Jorge M. Vázquez (2000), "Assignment of spending responsibilities and service delivery", In: M. M. Giugale and S. B. Webb, editors. *Achievements and Challenges of Fiscal Decentralization: Lessons from Mexico.* Washington, DC: World Bank, pp. 139-174.

Cantarero, D. and Marta Pascual (2008), "Analysing the impact of fiscal decentralization on health outcomes: empirical evidence from Spain", *Applied Economics Letters*, 15, pp. 109-111.

Gómez D. Octavio and Mauricio Ortiz (2004), "Seguro Popular de salud: Siete perspectivas", *Salud Pública de México*, 46(6), pp. 585-588.

Habibi, Nadir; Cindy Huang; Diego Miranda; Victoria Murillo; Gustav Ranis; Mainak Sarka and Frances Stewart. (2001), "Decentralization in Argentina", Yale Economic Growth Center, Discussion Paper No. 825.

Jiménez Rubio, Dolores (2011), "The impact of decentralization of health services on health outcomes: evidence from Canada", *Applied Economics*, 43(26), pp. 3907-3917.

Joumard, Isabelle; Christophe André; Chantal Nicq and Olivier Chatal (2008), "Health Status Determinants: Lifestyle, Environment, Health Care Resources and Efficiency", OECD Economics Department, Paper No. 627.

Merino, Gustavo (2003), "Descentralización del sistema de salud en el contexto del federalismo", In: *Caleidoscopio de la Salud, de la investigación a las políticas, y de las políticas a la acción*. México: Fundación Mexicana para la Salud, pp. 195-207.

Mosca, Ilaria; Luca Crivelli and Massimo Filippini (2006), "Federalism and regional health care expenditures: an empirical analysis for the Swiss cantons", *Health Economics*, 15(5), pp. 535-541.

Oates, Wayne (1972), "Fiscal Federalism", *Journal of Public Economics*, 2(2), pp. 188-191.

OECD (2005), "Reviews of the Health System", México OECD.

Ortega, J. (2004), “Diagnóstico jurídico y presupuestario del Ramo 33”, CIDE, México.

Prud'homme, Rémy (2004), “On the dangers of decentralization”, World Bank Policy Research, Working Paper No. 1252.

Robalino, David; Oscar Picazo and Albertus Voetberg (2001), “Does fiscal decentralization improve health outcomes? Evidence from a cross-country analysis”, World Bank Policy Research, Working Paper No. 2565.

Soares, Rodrigo (2007), “Health and the evolution of welfare across Brazilian municipalities”, *Journal of Development Economics*, 84(2), pp. 590-608.

Soto, Victoria; Maria Farfan and Vincent Lorant (2011), “Fiscal decentralization and infant mortality rates: The Colombian case”, unpublished.

Uchimura, Hiroko and Johannes Jütting (2007), "Fiscal Decentralization, Chinese Style: Good for Health Outcomes?", *World Development*, 37(12), pp. 1926-1934.

Weingast, Barry (2009), “Second generation fiscal federalism: The implications of fiscal incentives”, *Journal of Urban Economics*, 65(3), pp. 279-293.

Table 1: Health Expenditures Per Capita (Thousand Pesos, 2nd Half Dec 2010=100)

State	Total Public Expenditure		Social Security Expenditure 1\		Expenditure Ramo 12		Expenditure FASSA		State Expenditure	
	1993	2003	1993	2003	1993	2003	1998	2003	1999	2003
Aguascalientes	1.784	2.805	1.550	1.906	0.233	0.094	0.424	0.620	0.157	0.185
Baja California	2.431	2.430	2.216	1.994	0.216	0.088	0.278	0.346	0.016	0.003
Baja California Sur	3.686	4.223	2.997	3.100	**0.688**	0.116	**0.997**	**0.929**	0.034	0.078
Campeche	1.998	3.240	1.607	1.970	0.391	0.270	0.589	0.878	0.109	0.121
Coahuila	2.489	2.928	2.301	2.455	0.188	0.108	0.242	0.331	0.033	0.033
Colima	2.167	3.446	1.733	2.149	0.433	0.379	0.710	0.882	0.021	0.037
Chiapas	0.856	1.464	0.453	0.508	0.403	0.380	0.342	0.486	0.011	0.090
Chihuahua	2.050	2.586	1.829	1.926	0.221	0.129	0.233	0.377	0.116	0.153
Distrito Federal	**5.204**	**6.814**	**5.023**	**5.493**	0.180	**0.626**	0.199	0.279	0.370	0.417
Durango	1.673	2.526	1.274	1.644	0.399	0.240	0.395	0.617	0.005	0.025
Guanajuato	1.034	1.697	0.918	1.149	0.116	0.146	0.211	0.305	0.049	0.097
Guerrero	0.925	1.697	0.652	0.794	0.273	0.187	0.446	0.706	0.020	0.009
Hidalgo	1.085	1.888	0.786	0.926	0.299	0.384	0.328	0.546	0.021	0.031
Jalisco	1.712	2.423	1.574	1.669	0.137	0.051	0.254	0.432	0.219	0.271
México	0.980	1.372	0.803	0.814	0.178	0.192	0.236	0.361	0.011	0.005
Michoacán	0.862	1.503	0.623	0.855	0.239	0.207	0.237	0.382	0.011	0.059
Morelos	1.457	2.183	1.217	1.428	0.240	0.173	0.342	0.481	0.092	0.101
Nayarit	1.718	2.512	1.319	1.569	0.399	0.221	0.430	0.651	0.006	0.072
Nuevo León	2.464	2.934	2.291	2.537	0.173	0.051	0.230	0.305	0.032	0.041
Oaxaca	0.840	1.578	0.462	0.612	0.378	0.431	0.293	0.485	0.009	0.049
Puebla	1.043	1.594	0.854	0.988	0.189	0.223	0.180	0.295	0.041	0.088
Querétaro	1.544	2.074	1.310	1.377	0.234	0.112	0.336	0.543	0.022	0.042
Quintana Roo	2.025	2.476	1.606	1.633	0.420	0.092	0.492	0.657	0.093	0.095
San Luis Potosí	1.210	1.876	0.941	1.195	0.269	0.273	0.232	0.378	0.037	0.030
Sinaloa	1.761	2.545	1.549	1.782	0.212	0.229	0.258	0.385	0.081	0.148
Sonora	2.223	2.888	1.917	2.049	0.306	0.048	0.375	0.540	0.255	0.251
Tabasco	1.237	3.089	0.995	1.424	0.242	0.197	0.380	0.543	**0.573**	**0.925**
Tamaulipas	1.885	2.850	1.637	2.049	0.249	0.131	0.352	0.510	0.081	0.160
Tlaxcala	1.116	1.792	0.858	1.017	0.258	0.130	0.360	0.573	0.021	0.072
Veracruz	1.273	2.153	1.084	1.385	0.189	0.208	0.179	0.365	0.089	0.194
Yucatán	2.242	2.830	1.837	2.033	0.405	0.230	0.353	0.523	0.031	0.043
Zacatecas	1.059	2.043	0.706	1.057	0.353	0.470	0.284	0.455	0.028	0.061
National	1.782	2.502	1.550	1.716	0.232	0.230	0.275	0.420	0.097	0.136
Coefficient of variation	0.504	0.409	0.584	0.718	0.504	0.586	0.606	0.411	1.249	1.258

Note: Bold numbers are the highest values and underlined numbers are the lowest values. 1\ Social security institutions are IMSS, ISSSTE and PEMEX.
Source: Health Department Statistics: SINAIS.

Table 2: Total Health Expenditures as Percentage of GDP

State	Total Public Expenditure		Social Security Expenditure 1\		Expenditure Ramo 12		Expenditure FASSA		State Expenditure	
	1993	2003	1993	2003	1993	2003	1998	2003	1999	2003
Aguascalientes	2.356	2.776	2.048	1.886	0.308	0.093	0.502	0.613	0.177	0.183
Baja California	2.614	2.192	2.382	1.799	0.232	0.079	0.272	0.312	0.015	0.002
Baja California Sur	3.887	3.915	3.162	2.874	0.726	0.107	1.115	0.861	0.037	0.073
Campeche	1.641	2.287	1.320	1.391	0.321	0.191	0.555	0.620	0.092	0.086
Coahuila	2.873	2.261	2.656	1.896	0.217	0.083	0.238	0.256	0.032	0.026
Colima	2.933	3.494	2.347	2.179	0.587	0.384	0.986	0.894	0.027	0.037
Chiapas	2.708	3.204	1.434	1.112	1.274	0.831	1.175	1.063	0.039	0.198
Chihuahua	2.257	2.551	2.014	1.901	0.243	0.127	0.238	0.372	0.111	0.151
Distrito Federal	2.961	3.336	2.858	2.689	0.103	0.306	0.114	0.137	0.200	0.204
Durango	2.889	2.971	2.199	1.933	0.689	0.283	0.651	0.725	0.008	0.030
Guanajuato	2.135	2.107	1.895	1.427	0.240	0.181	0.414	0.379	0.094	0.120
Guerrero	2.295	3.395	1.619	1.589	0.677	0.375	1.228	1.413	0.049	0.019
Hidalgo	2.360	3.202	1.710	1.571	0.650	0.651	0.793	0.927	0.048	0.053
Jalisco	2.407	2.475	2.214	1.705	0.193	0.052	0.367	0.441	0.300	0.277
México	1.662	2.129	1.361	1.263	0.301	0.298	0.424	0.561	0.019	0.008
Michoacán	2.268	2.504	1.640	1.425	0.628	0.345	0.615	0.636	0.025	0.098
Morelos	2.101	2.839	1.755	1.858	0.346	0.225	0.554	0.626	0.142	0.131
Nayarit	3.661	4.240	2.811	2.648	0.851	0.372	1.056	1.098	0.013	0.122
Nuevo León	2.087	1.961	1.941	1.696	0.146	0.034	0.188	0.204	0.025	0.027
Oaxaca	2.652	3.633	1.460	1.410	1.193	0.993	1.029	1.116	0.028	0.114
Puebla	2.307	2.542	1.889	1.575	0.419	0.355	0.360	0.470	0.073	0.141
Querétaro	2.097	1.990	1.779	1.321	0.317	0.107	0.389	0.521	0.025	0.041
Quintana Roo	1.557	1.932	1.235	1.274	0.323	0.072	0.451	0.513	0.083	0.074
San Luis Potosí	2.360	2.594	1.835	1.652	0.525	0.377	0.457	0.523	0.072	0.042
Sinaloa	2.900	3.367	2.551	2.359	0.349	0.303	0.509	0.510	0.155	0.196
Sonora	2.711	2.965	2.338	2.103	0.373	0.049	0.452	0.555	0.301	0.258
Tabasco	2.623	5.828	2.110	2.687	0.513	0.371	0.896	1.025	1.262	1.745
Tamaulipas	2.663	3.080	2.312	2.214	0.351	0.141	0.481	0.551	0.104	0.173
Tlaxcala	2.987	3.283	2.296	1.863	0.690	0.238	0.980	1.050	0.054	0.132
Veracruz	2.955	3.626	2.516	2.332	0.439	0.351	0.437	0.615	0.214	0.327
Yucatán	4.104	3.869	3.363	2.780	0.741	0.315	0.659	0.715	0.054	0.059
Zacatecas	2.691	3.907	1.795	2.022	0.896	0.898	0.719	0.870	0.075	0.117
National	2.522	2.817	2.194	1.932	0.328	0.258	0.394	0.473	0.132	0.153
Coefficient of variation	0.229	0.294	0.241	0.252	0.873	0.941	0.783	0.631	1.683	1.959

Note: Bold numbers are the highest values and underlined numbers are the lowest values. 1\ Social security institutions are IMSS, ISSSTE and PEMEX.
Source: Health Department Statistics: SINAIS.

Table 3: Physical and Medical Resources per 1000 inhabitants

State	Doctors		Hospital Beds		Nurses		Medical Appointments	
	1990	2003	1990	2003	1990	2003	1990	2003
Aguascalientes	1.16	1.95	0.854	0.75	1.63	2.35	1229	1706
Baja California	**5.57**	1.35	0.787	0.64	**8.40**	1.77	1028	1357
Baja California Sur	0.31	2.53	1.424	1.11	0.49	2.96	**2205**	2256
Campeche	0.68	2.04	0.778	0.87	1.66	2.27	1252	2242
Coahuila	1.25	1.66	1.011	0.88	2.00	2.33	1910	1875
Colima	1.51	2.14	0.930	0.87	2.11	2.71	1900	2068
Chiapas	0.49	0.97	0.329	0.34	0.77	1.20	593	1762
Chihuahua	0.94	1.24	0.621	0.72	1.47	1.78	1363	1640
Distrito Federal	**2.76**	**2.88**	**2.027**	**1.36**	**4.24**	**3.60**	1618	1771
Durango	1.06	1.70	0.758	0.77	1.57	2.17	1280	2237
Guanajuato	0.73	1.07	0.605	0.52	1.02	1.32	864	1380
Guerrero	0.70	1.20	0.416	0.47	1.04	1.34	986	2017
Hidalgo	0.84	1.21	0.751	0.44	1.14	1.38	1052	2036
Jalisco	0.97	1.58	0.733	0.91	1.40	1.94	1166	1493
México	0.73	0.93	0.541	0.47	0.98	1.09	929	1505
Michoacán	0.69	1.00	0.407	0.49	0.88	0.96	947	1717
Morelos	0.88	1.40	0.487	0.52	1.56	1.77	1332	1523
Nayarit	1.01	1.81	0.733	0.62	1.56	2.06	1392	2194
Nuevo León	1.15	1.47	0.885	0.77	2.11	2.02	1647	1708
Oaxaca	0.61	1.11	0.401	0.43	0.90	1.35	794	1756
Puebla	0.66	1.16	0.543	0.58	0.99	1.33	821	1476
Querétaro	0.93	1.32	0.622	0.49	1.30	1.52	1092	1796
Quintana Roo	1.13	1.37	0.640	0.52	1.56	1.54	1490	1694
San Luis Potosí	0.75	1.18	0.492	0.57	1.13	1.62	1036	1708
Sinaloa	0.91	1.42	0.708	0.71	1.46	1.93	1469	2216
Sonora	1.11	1.63	0.831	0.93	1.64	2.09	1516	1622
Tabasco	1.19	1.80	0.751	0.70	1.59	2.03	1599	2414
Tamaulipas	1.31	1.73	0.773	0.87	1.82	2.17	1640	1854
Tlaxcala	0.93	1.38	0.502	0.50	1.24	1.61	1256	1759
Veracruz	0.88	1.33	0.517	0.60	1.04	1.48	1175	1714
Yucatán	1.29	1.61	0.814	0.78	1.44	2.07	1595	**2604**
Zacatecas	0.71	1.34	0.284	0.45	0.87	1.61	1206	1945
National	1.06	1.44	0.753	0.68	1.55	1.76	1195	1727
Coefficient of variation	0.82	0.29	0.44	0.33	0.84	0.30	0.30	0.178

Note: Bold numbers are the highest values and underlined numbers are the lowest values.

Source: Health Department Statistics: SINAIS.

Table 4: Health Indicators

State	Life Expectancy		Infant Mortality Rate[1\]		Fetal Deaths per 1000 People		Fetal Deaths per 1000 People Insured Population		Fetal Deaths per 1000 People Non-Insured Population	
	1990	2003	1990	2003	1993	2003	1993	2003	1993	2003
Aguascalientes	72.024	74.568	31.815	15.518	0.387	0.252	0.294	0.197	0.600	0.339
Baja California	72.241	74.916	24.964	14.049	0.333	0.287	0.283	0.296	0.475	0.272
Baja California Sur	73.154	75.217	30.189	14.351	0.241	0.210	0.174	0.190	0.482	0.251
Campeche	70.135	73.910	38.898	18.702	0.254	0.122	0.180	0.124	0.339	0.120
Coahuila	71.967	74.216	29.761	14.130	0.392	0.238	0.351	0.276	0.405	0.229
Colima	71.468	74.550	34.552	14.763	0.272	0.214	0.278	0.201	0.260	0.238
Chiapas	66.364	72.743	60.723	25.237	0.197	0.128	0.173	0.108	0.335	0.186
Chihuahua	71.980	74.813	32.171	15.807	0.343	0.188	0.262	0.198	0.540	0.174
Distrito Federal	73.727	75.167	22.360	13.420	0.442	0.412	0.334	0.315	0.783	0.548
Durango	69.975	73.797	40.454	18.757	0.180	0.115	0.124	0.085	0.275	0.149
Guanajuato	70.292	74.297	41.992	19.092	0.500	0.341	0.459	0.377	0.536	0.317
Guerrero	67.294	72.498	55.674	25.887	0.056	0.084	0.063	0.050	0.053	0.095
Hidalgo	68.623	73.703	46.964	19.668	0.374	0.226	0.299	0.210	0.416	0.234
Jalisco	71.539	74.459	33.746	15.953	0.364	0.274	0.391	0.277	0.326	0.271
México	71.735	74.558	32.935	16.712	0.277	0.183	0.299	0.195	0.264	0.177
Michoacán	69.671	73.851	44.819	20.616	0.291	0.220	0.233	0.232	0.359	0.212
Morelos	71.121	74.792	34.844	15.804	0.352	0.330	0.270	0.272	0.450	0.382
Nayarit	70.390	74.200	41.120	17.945	0.145	0.076	0.126	0.062	0.168	0.088
Nuevo León	72.695	74.735	24.903	12.443	0.219	0.145	0.196	0.120	0.297	0.205
Oaxaca	66.631	72.991	54.766	23.236	0.282	0.205	0.180	0.178	0.325	0.214
Puebla	68.528	73.726	47.832	21.108	0.494	0.336	0.522	0.268	0.477	0.366
Querétaro	70.131	74.189	39.991	17.732	0.511	0.296	0.399	0.234	0.656	0.363
Quintana Roo	71.024	75.052	37.987	15.364	0.337	0.231	0.274	0.197	0.431	0.273
San Luis Potosí	69.415	74.042	43.649	18.813	0.375	0.222	0.364	0.194	0.384	0.243
Sinaloa	70.821	73.972	36.834	16.904	0.053	0.033	0.052	0.029	0.054	0.037
Sonora	71.784	74.395	30.061	14.755	0.206	0.182	0.163	0.132	0.334	0.272
Tabasco	69.656	73.692	43.103	19.183	0.335	0.207	0.214	0.148	0.416	0.240
Tamaulipas	71.374	74.263	31.397	14.525	0.222	0.133	0.196	0.110	0.269	0.166
Tlaxcala	70.533	74.660	41.064	18.740	0.380	0.309	0.285	0.259	0.452	0.336
Veracruz	68.686	72.972	46.672	21.416	0.276	0.190	0.244	0.158	0.300	0.208
Yucatán	69.900	73.949	39.186	18.092	0.286	0.205	0.250	0.153	0.333	0.261
Zacatecas	69.064	74.344	47.542	20.156	0.297	0.215	0.263	0.195	0.320	0.227
National	70.509	74.131	39.088	18.086	0.302	0.213	0.256	0.189	0.379	0.240
Coefficient of variation	0.025	0.009	0.232	0.183	0.041	0.033	0.043	0.034	0.062	0.041

Note: The numbers in black represent the highest and the underlined numbers represent the lowest numbers.

1\ United Nations estimates. Millennium Development Goals.

Source: Health Department Statistics: SINAIS and United Nations.

Table 5: Summary Statistics (1993-2003)

Panel A – Ramo 12 (1993 - 1997)					Panel B – FASSA (1998 - 2003)				
Variables	Mean	Std. Dev.	Min.	Max	Variables	Mean	Std. Dev.	Min.	Max
Ramo12 Per Capita$_{it}$	278.77	116.93	100.82	724.83	*FASSA Per Capita $_{it}$*	438.36	176.95	178.79	1034.61
Ramo12 Per Capita $_{i,1992}$	253.94	100.60	108.34	583.68	*Ramo12 Per Capita $_{i,1997}$*	310.96	119.53	173.37	724.83
Infant Mortality Rate$_{it}$	27.51	4.89	16.59	40.87	*Infant Mortality Rate$_{it}$*	19.56	3.97	12.44	32.86
Deaths by Infectious and Parasitic Diseases$_{it}$	0.25	0.09	0.12	0.73	*Deaths by Infectious and Parasitic Diseases$_{it}$*	0.20	0.06	0.09	0.42
Doctors for Non-Insured Population$_{it}$	1.36	1.05	0.51	10.18	*Doctors for Non-Insured Population$_{it}$*	1.41	0.61	0.64	3.83
Proportion of Non-Insured Population$_{it}$	0.47	0.15	0.15	0.78	*Proportion of Non-Insured population$_{it}$*	0.50	0.14	0.22	0.80
Total Population$_{it}$	2.86	2.44	0.35	12.11	*Total Population$_{it}$*	3.09	2.63	0.41	13.59
Gross State Product Per Capita$_{it}$	66.12	31.61	26.76	185.65	*Gross State Product Per Capita$_{it}$*	76.36	36.35	28.46	213.92
Total number of observations is 160 for each variable					Total number of observations is 192 for each variable				

Note: The definition and units of the variables are in Table 8.

Table 6: Ramo 12 and FASSA Determinants

	Panel A - (1993 - 1997) ***Dependent Variable is Ramo 12 Per Capita***						***Panel B - (1998-2003)*** ***Dependent Variable is FASSA Per Capita***					
	Panel Data		***Cross Section***				***Panel Data***		***Cross Section***			
Independent Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	***Independent Variables***	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
	1993 to 1997	*1993 to 1997*	*1993*	*1993*	*1997*	*1997*		*1998 to 2003*	*1998 to 2003*	*1998*	*1998*	*2003*	*2003*
Ramo 12 Per Capita $_{i\ 1992}$	0.963***	--	1.083***	--	0.909***	--	*Ramo 12 Per Capita* $_{i\ 1997}$	1.329***	--	1.401***	--	1.279***	--
	(0.0461)	--	(0.0582)	--	(0.122)	--		(0.111)	--	(0.0891)	--	(0.191)	--
Infant Mortality Rate $_{i\ t-1}$	0.354	-19.88	-0.571	17.87*	-2.163	11.77	*Infant Mortalify Rate* $_{i\ t-1}$	-1.837	-18.11***	-3.637	8.341	7.228	13.52
	(2.638)	(12.84)	(1.810)	(8.862)	(9.687)	(7.554)		(2.585)	(5.353)	(2.185)	(11.30)	(5.234)	(15.47)
Deaths by Infectious and Parasitic Diseases $_{i\ t-1}$	78.12	134.7	56.57	-62.07	-170.6	-419.6	*Deaths by Infectious and Parasitic Diseases* $_{i\ t-1}$	-172.7*	252.6	73.60	-351.5	-319.6**	-639.5
	(51.00)	(136.1)	(47.42)	(158.2)	(163.2)	(258.0)		(92.49)	(211.4)	(59.97)	(314.7)	(146.1)	(413.5)
Doctors for Non-Insured Population $_{i\ t-1}$	6.022	20.72	6.939	64.36	37.94**	89.14*	*Doctors for Non-Insured Population* $_{i\ t-1}$	-7.265	9.011**	-13.19***	22.78	-4.810	145.8**
	(6.964)	(25.97)	(6.420)	(43.65)	(14.15)	(45.20)		(4.723)	(3.655)	(4.709)	(23.18)	(27.90)	(64.10)
Proportion of Non-Insured Population $_{i\ t-1}$	-4.082	2.082**	-37.91	-126.0	207.0	120.9	*Proportion of Non-Insured Population* $_{i\ t-1}$	-89.59	241.2	-208.7*	-310.8	-152.1	80.43
	(61.76)	(880.3)	(64.34)	(240.1)	(197.7)	(288.9)		(92.46)	(326.7)	(105.2)	(479.3)	(135.8)	(389.8)
Total Population $_{i\ t-1}$	-5.171***	77.86	-3.230*	-24.71**	-5.894*	-21.49**	*Total Population* $_{i\ t-1}$	-4.383*	-45.06	2.182	-34.39**	-7.270*	-30.19*
	(1.874)	(46.21)	(1.731)	(11.63)	(3.274)	(10.04)		(2.541)	(35.56)	(2.172)	(16.13)	(3.923)	(15.43)
Gross State Product per Capita $_{i\ t}$	-0.0607	0.378	-0.540**	0.201	0.643	0.956	*Gross State Product per Capita* $_{i\ t}$	-1.046**	0.986	-1.179**	-0.361	-0.889	-0.329
	(0.200)	(0.763)	(0.224)	(0.875)	(0.437)	(0.926)		(0.432)	(0.630)	(0.450)	(1.684)	(0.734)	(1.752)
Constant	17.36	-293.3	63.33	-235.6	1.177	-71.49	*Constant*	274.0***	715.1***	184.2***	467.3	218.4*	251.2
	(66.89)	(401.1)	(52.50)	(232.8)	(158.2)	(144.4)		(61.69)	(202.3)	(49.51)	(309.4)	(117.2)	(330.9)
Year Indicator	Yes	Yes	--	--	--	--	***Year Indicator***	Yes	Yes	--	--	--	--
Fixed Effects	No	Yes	--	--	--	--	***Fixed Effects***	No	Yes	--	--	--	--
R-squared	0.878	0.565	0.958	0.500	0.847	0.502	***R-squared***	0.934	0.805	0.978	0.351	0.923	0.528
Observations	160	160	32	32	32	32	***Observations***	192	192	32	32	32	32

Panel data estimations show state cluster robust standard errors in parentheses & cross section estimations show robust standard errors in parentheses.

Note: *** p<0.01, ** p<0.05, *p<0.10.

Table 7: Summary Statistics 1993-2003

Variables	Mean	Std. Dev.	Min	Max
Log(Infant Mortality Rate)	3.110	0.255	2.521	3.710
Ramo 12 Per Capita	0.190	0.144	0.000	0.725
Insured Health Services Expenditure Per Capita	2.663	1.030	1.173	9.384
Hospital Beds in the Private Health Sector	0.297	0.132	0.082	0.832
Gross State Product Per Capita	71.70	34.61	26.75	213.9
Primary School Completion Rate	85.52	9.185	43.42	99.16
Population Density	266.3	1003	4.780	5920
Proportion of Non-Insured Population	0.490	0.148	0.148	0.798
Total Health Expenditure for the Non-Insured Population	0.946	0.567	0.167	3.356
Total Health Expenditure for the Insured Population	2.664	1.031	1.173	9.384
Total Health Expenditure	1.805	1.196	0.167	9.384
log(Total Health Expenditure) for the Non-Insured Population	-0.218	0.577	-1.792	1.211
log(Total Health Expenditure) for the Insured Population	0.928	0.305	0.160	2.239
log(Total Health Expenditure)	0.355	0.736	-1.792	2.239
Fetal Deaths for the Non-Insured Population	0.304	0.130	0.035	0.783
Fetal Deaths for the Insured Population	0.220	0.094	0.026	0.522
Fetal Deaths	0.262	0.121	0.026	0.783
log(Fetal Deaths) for the Non-Insured Population	-1.307	0.538	-3.352	-0.244
log(Fetal Deaths) for the Insured Population	-1.634	0.547	-3.666	-0.650
log(Fetal Deaths)	-1.470	0.566	-3.666	-0.244

Total number of observations is 352 for all variables with the exception of total health expenditure, fetal deaths and its logarithmic function which have 704 observations.
Note: The definition and units of the variables are in Table 8.

Table 8:Definition of Variables

Variable	Definition	Units	Source
$FASSA_{it}$	Health Services Fund for state *i* and year *t*	Thousand pesos Per Capita	Ministry of Health
$Ramo\ 12_{it}$	Federal government directly spend on health services for state *i* and *t*	Thousand pesos Per Capita	SINAIS
THE_{ijt}	Total health expenditure for state i, year t and group j divided by population for state i, year t and group j [2]	Thousand pesos Per insured or non-insured population	Ministry of Health
IMR_{it} [1]	Natural logarithm of the infant mortality rate for state *i* and year *t*	Per 1000 live births by state	UN Millennium Development Goals
$IMR_{Biased,it}$	Natural logarithm of the infant mortality rate for state *i* and year *t*	Per 1000 live births by state	SINAIS
$IMR_{Ratio,it}$	$\log(IMR_{it}) - \log(IMR_{Biased,it})$	N.A.	N.A.
FDR_{ijt}	Natural logarithm of fetal deaths for state i, year t, and group j divided by population in state *i,* year *t,* and group j [2]	Per 100 insured or non-insured population individuals	INEGI
DIP_{it}	Deaths by infectious and parasitic diseases for state *i* and *t*	Per 1000 inhabitants by state	Ministry of Health
GSP_{it}	Gross State Product for state *i* and *t*	Thousand pesos Per Capita (2nd half dec 2010=100)	INEGI
$HEEP_{it}$	Health Services Expenditure from public institutions (IMSS, ISSSTE,PEMEX) for state *i* and *t*	Thousand pesos Per Capita (2nd half dec 2010=100)	Ministry of Health
$HBPS_{it}$	Hospital Beds in the Private Health Sector for state *i* and *t*	Per 1000 inhabitants by state	SINAIS
PUP_{it}	Proportion of non-insured Population for state *i* and *t*	Between zero and one	Ministry of Health
Pop_{it}	Total population for state *i* and *t*	Total number of inhabitants per state	CONAPO
$PSCR_{it}$	Percentage of students who completed primary school in 6 years for state *i* and year *t*	Percentage	UN Millennium Development Goals
$DNIP_{it}$	Doctors for non-insured population for state *i* and year *t*	Per 1000 inhabitants non-insured	SINAIS
DP_{it}	Population Density for state *i* and *t*	Inhabitants per Km^2	INEGI
$I(t>1997)$	Is an indicator function that takes value zeros for years before the reform was implemented and zero after the reform.	N.A.	N.A.

1\ of children less than one year old.

2\ j is insured or non-insured group.

Sources:

CONAPO: National Population Council.
SINAIS: Bureau of Health Information in Mexico.
INEGI: National Institute of Statistics, Geography and Informatics of Mexico.
UN: United Nations. Millennium Development Goals Statistics.

Table 9: Fixed Effects Panel Estimated Coefficients

Independent Variables	Log Infant Mortality Rate					Log Fetal Deaths Rate
	(1)	(2)	(3)	(4)	(5)	(6)
b_1 *Decentralization I(t<1997)*	-0.239***	-0.228***	-0.189***	-0.0807***	-0.074***	0.0864*
	(0.047)	(0.025)	(0.022)	(0.013)	(0.012)	(0.0427)
b_2 *Ramo 12 $_{it}$ Per Capita*	0.201	-0.337***	-0.353***	-0.061	-0.018	0.123
	(0.252)	(0.096)	(0.078)	(0.052)	(0.060)	(0.304)
b_3 *Ramo 12 $_{it}$ Per Capita*I(t>1997)*	0.0387	0.006	0.088	0.093	0.014	-0.549
	(0.324)	(0.131)	(0.126)	(0.059)	(0.065)	(0.499)
b_4 *FASSA $_{it}$ Per Capita*I(t>1997)*	-0.177	-0.394***	-0.340***	-0.097*	-0.068	-0.129
	(0.152)	(0.055)	(0.080)	(0.050)	(0.056)	(0.203)
Time Trend	--	--	--	-0.047***	--	--
	--	--	--	(0.002)	--	--
Gross State Product Per Capita $_{it}$	--	--	-0.003***	-0.0005	-0.0006	0.00119
	--	--	(0.0007)	(0.0003)	(0.0004)	(0.00150)
Population Density $_{it}$	--	--	0.0002	0.0001	0.0003***	0.00346***
	--	--	(0.0004)	(0.0001)	(0.0001)	(0.00124)
Total Health from Public Institutions Per Capita $_{ijt}$	--	--	0.073***	0.036**	0.027*	0.0802*
	--	--	(0.01)	(0.013)	(0.013)	(0.0412)
Proportion of Non-Insured Population $_{it}$	--	--	-1.712***	-0.159	-0.318*	-0.894
	--	--	(0.209)	(0.147)	(0.182)	(0.710)
Primary School Completion Rate $_{it}$	--	--	-0.005***	0.001**	0.002**	0.00515
	--	--	(0.001)	(0.0009)	(0.0008)	(0.00498)
Hospital Beds in the Private Sector $_{it}$	--	--	0.061	0.069	0.055	0.0156
	--	--	(0.075)	(0.042)	(0.040)	(0.116)
Constant	3.243***	3.393***	4.596***	3.402***	3.012***	1.021
	(0.072)	(0.028)	(0.142)	(0.124)	(0.133)	(0.637)
Year Indicators	No	No	No	No	Yes	Yes
Fixed effects	No	Yes	Yes	Yes	Yes	Yes
$b_4 - b_2$	-0.378	-0.056	0.012	-0.036	-0.05	-0.252
$b_4 - b_2 \sim F_1$	3.779	0.48	0.0497	1.119	1.87	3.601
Prob > F_1	0.061	0.494	0.825	0.298	0.181	0.0671
$b_4 - (b_2 + b_3)$	-0.417	-0.063	-0.076	-0.13	-0.064	0.298
$b_4 - (b_2 + b_3) \sim F_1$	1.705	0.394	0.377	4.883	1.231	0.494
Prob > F_2	0.201	0.535	0.544	0.034	0.276	0.487
Number of Groups		32	32	32	32	32
Number of Observations	352	352	352	352	352	352
R-squared	0.474	0.872	0.936	0.973	0.983	0.316
R-squared Overall		0.401	0.003	0.103	0.005	0.0869
R-squared Between		0.0292	0.458	0.187	0.154	0.0923

Panel data estimations show state cluster robust standard errors in parentheses.
Note: *** p<0.01, ** p<0.05, *p<0.10.

Table 10: Mean Comparison Between Low and High FASSA States
Null Hypothesis: High FASSA Mean – Low FASSA Mean = 0

	Year	*High FASSA Per Capita Mean*	*Low FASSA Per Capita Mean*	*P-value*
FASSA Per Capita	1998	457.66	242.18	0.00
Ramo 12 Per Capita	1997	392.51	229.40	0.00
Hospital Beds in the Private Health Sector Per Thousand Inhabitants	1998	0.21	0.29	0.04
Population Density a/	1997	77.46	451.10	0.30
Log (Infant Mortality Rate)	1997	3.20	3.17	0.71
Infant Mortality Rate	1997	24.88	24.28	0.73
Gross State Product Per Capita	1997	65993	68259	0.85
Primary School Completion Rate	1997	86.96	87.40	0.89
Proportion of Non-Insured Population	1997	0.49	0.49	0.90
Health Service Expenditure from IMSS,ISSSTE,PEMEX Per Insured Person	1997	2343	2330	0.97
Number of Observations		16	16	

a/ Population density of the Low FASSA group in 1997 (451.10) seems to quite bigger than the High FASSA counterpart; this difference is mainly explained because Distrito Federal belongs to the Low FASSA group. Alone in 1997 Distrito Federal had a population density of 5786.15 habitants per square kilometer. By excluding Distrito Federal from the Low FASSA group the new population density mean would be 95.43 and the new P-value would be 0.6531.

Table 11: Difference in Difference Estimated Coefficients (Pseudo Experiment)

Independent Variables	Log Infant Mortality Rate						Log Fetal Deaths Rate
	(1)	(2)	(3)	(4)	(5)	(6) a/	(7)
I(High FASSA group)	0.021	-0.264***	-0.573***	-0.348***	-0.407***	-0.393***	-0.275
	(0.057)	(0.007)	(0.106)	(0.047)	(0.054)	(0.065)	(0.274)
Decentralization I(t>1997)	-0.341***	-0.341***	-0.255***	-0.080***	--	-0.066***	--
	(0.007)	(0.008)	(0.024)	(0.012)	--	(0.017)	--
*I(High FASSA group)*Decentralization I(t>1997)*	-0.007	-0.007	-0.022	-0.003	-0.002	0.007	-0.147
	(0.013)	(0.013)	(0.018)	(0.012)	(0.011)	(0.016)	(0.097)
Gross State Product Per Capita $_{it}$	--	--	-3.875***	-0.548	-0.587	-0.864*	0.213
	--	--	(0.765)	(0.396)	(0.431)	(0.446)	(1.474)
Total Health from Public Institutions PC $_{ijt}$	--	--	0.036**	0.028**	0.023*	0.026*	0.038
	--	--	(0.018)	(0.011)	(0.012)	(0.013)	(0.044)
Ramo 12 Per Capita $_{it}$	--	--	-0.152**	0.045	0.036	0.101**	-0.332
	--	--	(0.069)	(0.039)	(0.033)	(0.040)	(0.340)
Primary School Completion Rate $_{it}$	--	--	-0.005***	0.002***	0.002***	0.003**	0.007
	--	--	(0.001)	(0.001)	(0.001)	(0.001)	(0.006)
Population Density $_{it}$	--	--	0.001	0.000**	0.000***	0.000	0.003***
	--	--	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)
PUP $_{it}$	--	--	-2.107***	-0.166	-0.367*	-0.316	-0.894
	--	--	(0.241)	(0.162)	(0.205)	(0.205)	(0.663)
HBPS $_{it}$	--	--	0.019	0.076	0.048	0.153**	-0.016
	--	--	(0.088)	(0.046)	(0.046)	(0.059)	(0.121)
Time Trend	--	--	--	-0.049***	--	-0.049***	--
	--	--	--	(0.002)	--	(0.003)	--
Constant	3.288***	3.448***	5.114***	3.585***	2.962***	3.621***	-4.986***
	(0.044)	(0.004)	(0.123)	(0.120)	(0.155)	(0.136)	(0.520)
Year Indicators	No	No	No	No	Yes	No	Yes
Fixed Effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	352	352	352	352	352	220	352
Number of Groups	32	32	32	32	32	20	32
R-squared	0.457	0.904	0.958	0.985	0.991	0.983	0.948

Panel data estimations show state cluster robust standard errors in parentheses.
Note: *** p<0.01, ** p<0.05, *p<0.10.
a/ Only for Top 10 and Bottom 10 FASSA states.

Table 12: Difference in Difference Estimated Coefficients

Independent Variables	Log Fetal Deaths Rate						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Non-Insured I(J=Non-Insured)	0.478***	0.478***	0.534***	0.587***	0.621***	0.512***	0.743***
	(0.0423)	(0.0433)	(0.0952)	(0.0907)	(0.100)	(0.125)	(0.0902)
Decentralization I(t>1997)	-0.340***	-0.227***	-0.150**	-0.0196	-0.162**	-0.213***	-0.174**
	(0.0450)	(0.0492)	(0.0602)	(0.0517)	(0.0709)	(0.0632)	(0.0647)
*Non-Insured I(J=Non-Insured)*Decentralization I(t>1997)*	0.0175	0.0175	0.000165	-0.0169	-0.0269	-0.0294	-0.0581
	(0.0311)	(0.0318)	(0.0452)	(0.0454)	(0.0469)	(0.0499)	(0.0439)
Total Health from Public Institutions Per Capita $_{ijt}$	--	--	0.0405	0.0795	0.104	0.148	0.104
	--	--	(0.0692)	(0.0684)	(0.0798)	(0.0971)	(0.0725)
Primary School Completion Rate $_{it}$	--	--	-0.00494*	0.00390	0.00305	0.00331	0.00285
	--	--	(0.00269)	(0.00337)	(0.00361)	(0.00331)	(0.00332)
Population Density $_{it}$	--	--	0.00250***	0.00251***	0.00258**	0.00253**	0.00280***
	--	--	(0.000720)	(0.000896)	(0.000976)	(0.000927)	(0.000948)
Hospital Beds in the Private Sector $_{it}$	--	--	-0.0606	0.00357	-0.0354	-0.0805	-0.0847
	--	--	(0.0841)	(0.102)	(0.130)	(0.116)	(0.123)
Gross State Product Per Capita $_{it}$	--	--	-3.72e-05**	-1.77e-06	1.59e-05	1.09e-05	1.20e-05
	--	--	(1.62e-05)	(1.43e-05)	(1.60e-05)	(1.66e-05)	(1.54e-05)
Proportion of Non-Insured Population $_{it}$	--	--	-2.471***	-0.637	-1.281*	-1.103	-1.498**
	--	--	(0.577)	(0.652)	(0.751)	(0.716)	(0.691)
Infant Mortality Rate Bias $_{it}$	-0.823***	0.0189	-0.115	-0.157	-0.155	-0.187*	-0.157
	(0.141)	(0.105)	(0.111)	(0.107)	(0.115)	(0.101)	(0.111)
Trend	--	--	--	-0.0252***	--	--	--
	--	--	--	(0.00437)	--	--	--
Constant	-1.172***	-1.225***	-0.00731	-1.611***	-1.588***	-1.493***	-1.491***
	(0.0811)	(0.0565)	(0.230)	(0.397)	(0.389)	(0.351)	(0.356)
Year Indicators	No	No	No	No	Yes	Yes	Yes
Fixed Effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	704	704	704	704	704	704	704
R-squared	0.638	0.886	0.896	0.901	0.904	0.894	0.916

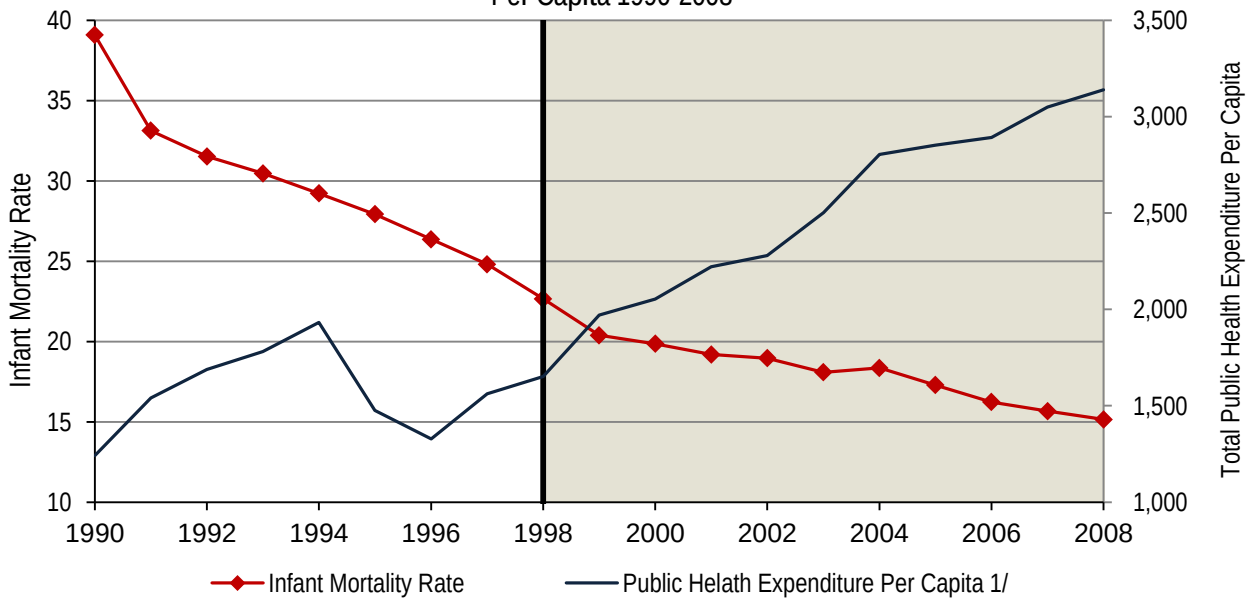
Panel data estimations show state cluster robust standard errors in parentheses.
Note: *** p<0.01, ** p<0.05, *p<0.10.

Table 13: Health Expenditure Efficiency Comparison: Estimated Coefficients

Independent Variables	Log Fetal Deaths Rate						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
b_1 *Non-Insured I(J=Non-Insured)*	0.510***	0.484***	0.452***	0.516***	0.538***	0.351**	0.642***
	(0.167)	(0.133)	(0.125)	(0.125)	(0.144)	(0.163)	(0.118)
b_2 *Decentralization I(t>1997)*	-0.215	-0.189	-0.195**	-0.0414	-0.194*	-0.220**	-0.228**
	(0.177)	(0.127)	(0.0926)	(0.0923)	(0.102)	(0.0924)	(0.0995)
b_3 *Non-Insured I(J=Non-Insured)*Decentralization I(t>1997)*	-0.127	-0.114	-0.0180	-0.0623	-0.0630	-0.109	-0.0764
	(0.168)	(0.128)	(0.0822)	(0.0840)	(0.0885)	(0.0724)	(0.0877)
b_4 *Total Health from Public Institutions Per Capita* $_{ijt}$	-0.00220	-0.104	-0.130	-0.0694	-0.0511	-0.105	-0.0780
	(0.156)	(0.137)	(0.122)	(0.125)	(0.147)	(0.169)	(0.115)
b_5 *Total Health from Public Institutions Per Capita* $_{ijt}$ ** I(t>1997)*	-0.123	-0.0254	0.0668	0.0287	0.0322	0.0126	0.0587
	(0.163)	(0.132)	(0.0711)	(0.0737)	(0.0788)	(0.0685)	(0.0764)
b_6 *Total Health from Public Institutions Per Capita* $_{ijt}$ ** I(J=Non-Insured)*	0.0637	0.269*	0.277**	0.241*	0.235*	0.339**	0.270**
	(0.155)	(0.137)	(0.121)	(0.123)	(0.134)	(0.151)	(0.110)
b_7 *Total Health from Public Institutions Per Capita* $_{ijt}$ ** I(J=Non-Insured) * Decentralization I(t>1997)*	-0.187	-0.231	-0.260**	-0.199*	-0.192*	-0.161	-0.235**
	(0.177)	(0.156)	(0.0987)	(0.102)	(0.102)	(0.1000)	(0.0980)
b_8 *Primary School Completion Rate* $_{it}$	--	--	-0.00615**	0.00214	0.00195	0.00237	0.00160
	--	--	(0.00245)	(0.00299)	(0.00332)	(0.00295)	(0.00299)
b_9 *Population Density* $_{it}$	--	--	0.00190***	0.00200**	0.00215**	0.00210**	0.00231**
	--	--	(0.000584)	(0.000823)	(0.000900)	(0.000842)	(0.000880)
b_{10} *Hospital Beds in the Private Sector* $_{it}$	--	--	0.00316	0.0562	-0.00393	-0.0420	-0.0484
	--	--	(0.0925)	(0.114)	(0.141)	(0.127)	(0.132)
b_{11} *Gross State Product per Capita* $_{it}$	--	--	-2.64e-05*	6.32e-06	1.82e-05	1.33e-05	1.36e-05
	--	--	(1.51e-05)	(1.42e-05)	(1.54e-05)	(1.62e-05)	(1.47e-05)
b_{12} *Proportion of Non-Insured Population* $_{it}$	--	--	-1.957***	-0.273	-0.830	-0.559	-1.039
	--	--	(0.505)	(0.548)	(0.672)	(0.619)	(0.633)
b_{13} *Infant Mortality Rate Bias* $_{it}$	-0.826***	-0.0343	-0.127	-0.167	-0.170	-0.202*	-0.172
	(0.142)	(0.108)	(0.113)	(0.109)	(0.114)	(0.0996)	(0.110)
Time Trend	--	--	--	-0.0234***	--	--	--
	--	--	--	(0.00403)	--	--	--
Constant	-1.168***	-1.124***	0.0560	-1.466***	-1.467***	-1.339***	-1.324***
	(0.169)	(0.119)	(0.279)	(0.394)	(0.396)	(0.361)	(0.349)
Year Indicators	No	No	No	No	Yes	Yes	Yes
Fixed Effects	No	Yes	Yes	Yes	Yes	Yes	Yes
$b_4 + b_5 + b_6 + b_7$	-0.248	-0.0906	-0.0462	0.00152	0.0242	0.0862	0.0156
Prob > F1	0.000732	0.199	0.554	0.984	0.766	0.282	0.837
$b_4 + b_6$	0.0615	0.165	0.147	0.172	0.184	0.235	0.192
Prob > F2	0.373	0.00267	0.00761	1.83E-03	2.89E-03	0.0000985	0.000778
$b_5 + b_7$	-0.31	-0.256	-0.193	-0.17	-0.16	-0.148	-0.176
Prob > F3	0.0000336	2.47E-03	8.70E-03	0.0165	0.0228	0.0348	0.00915
$b_4 + b_5$	-0.126	-0.129	-0.0631	-0.0406	-0.0189	-0.0922	-0.0193
Prob > F4	0.605	0.0506	0.432	0.648	0.861	0.445	0.821
Number of Observations	704	704	704	704	704	704	704
R-squared	0.649	0.893	0.900	0.905	0.907	0.900	0.920

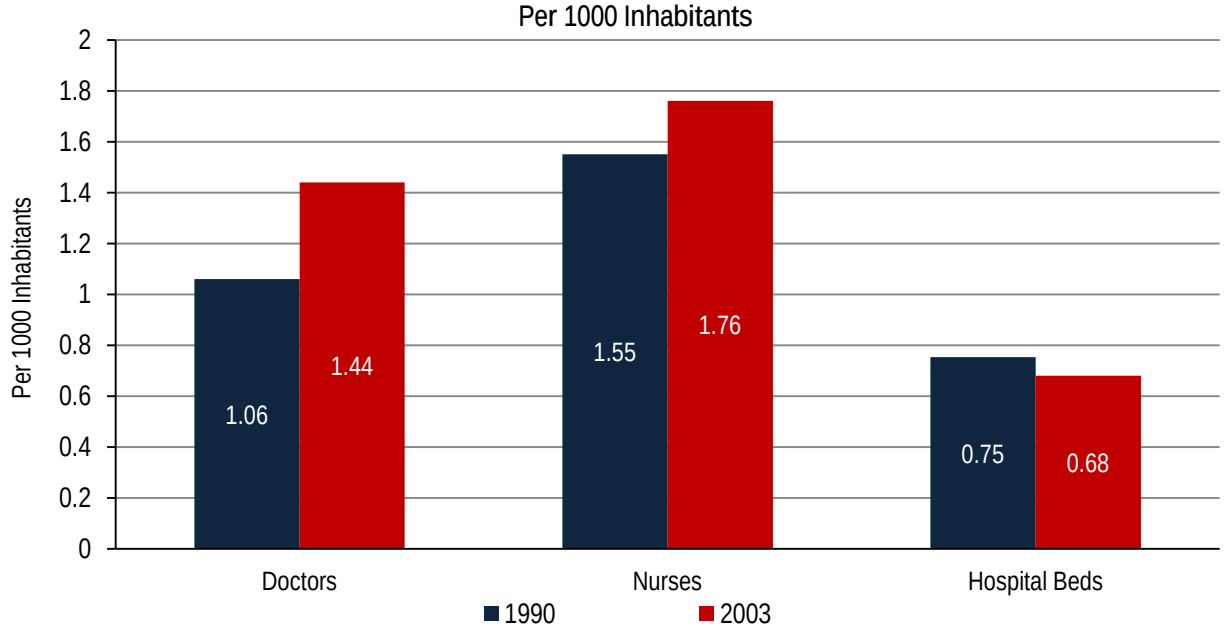
Panel data estimations show state cluster robust standard errors in parentheses.
Note:*** p<0.01, ** p<0.05, *p<0.10.

Figure 1: Infant Mortality Rate and Public Health Expenditure Per Capita 1990-2008



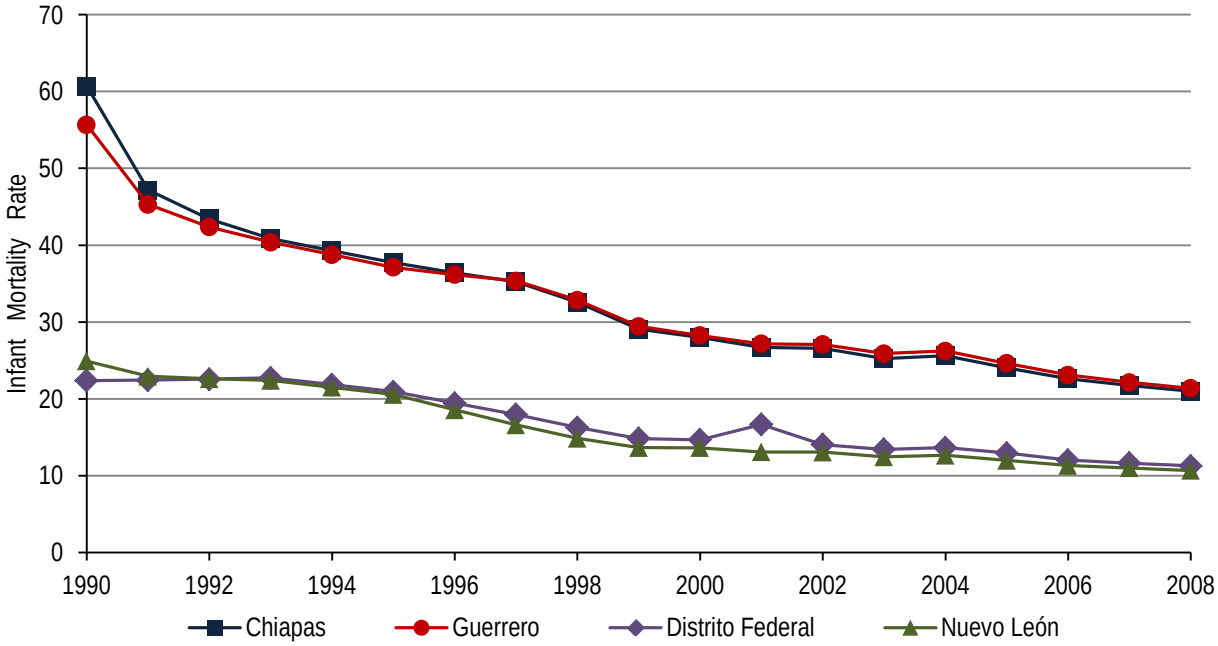
1/ Units expressed in 2010 pesos.
Source: Own elaboration with data from SINAIS.

Figure 2: Physical and Medical Resources Per 1000 Inhabitants



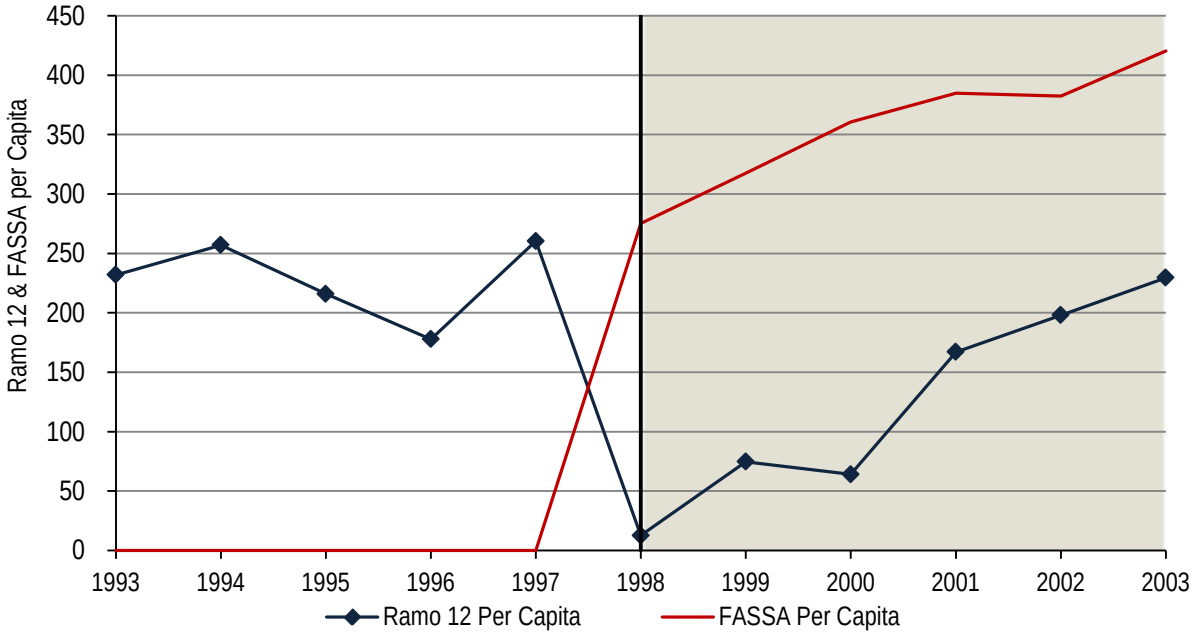
Source: Own elaboration with data from SINAIS.

Figure 3: Infant Mortality Rate
Selected States



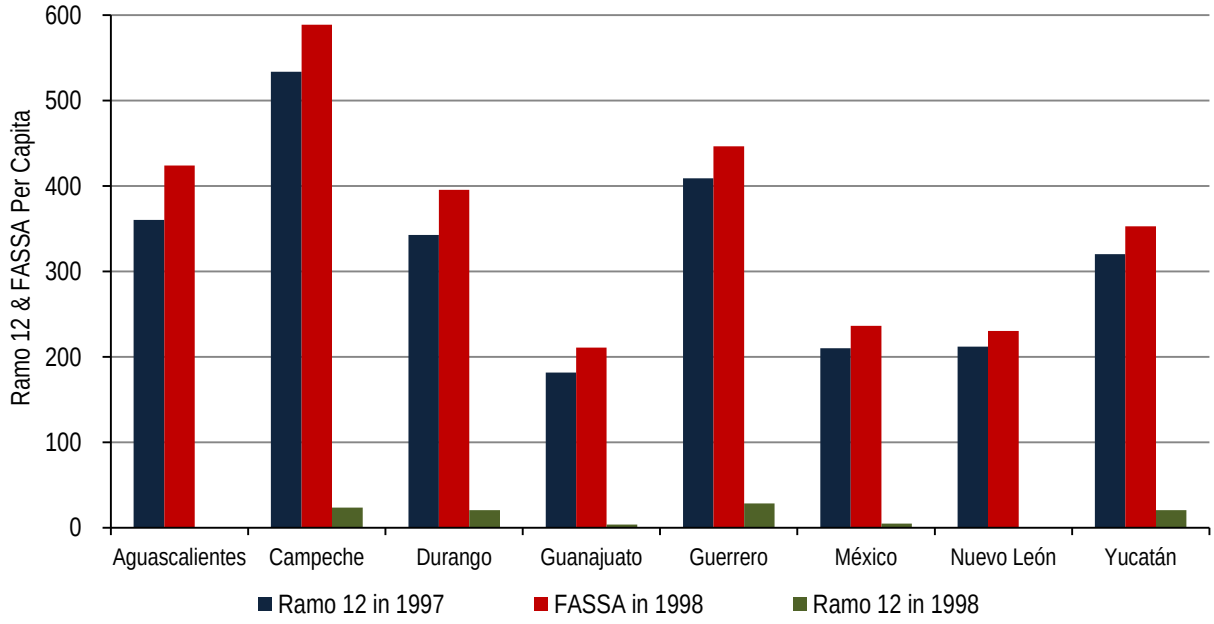
Source: Own elaboration with data from UN Millennium Development Goals.

Figure 4: Ramo 12 & FASSA Per Capita
National Level



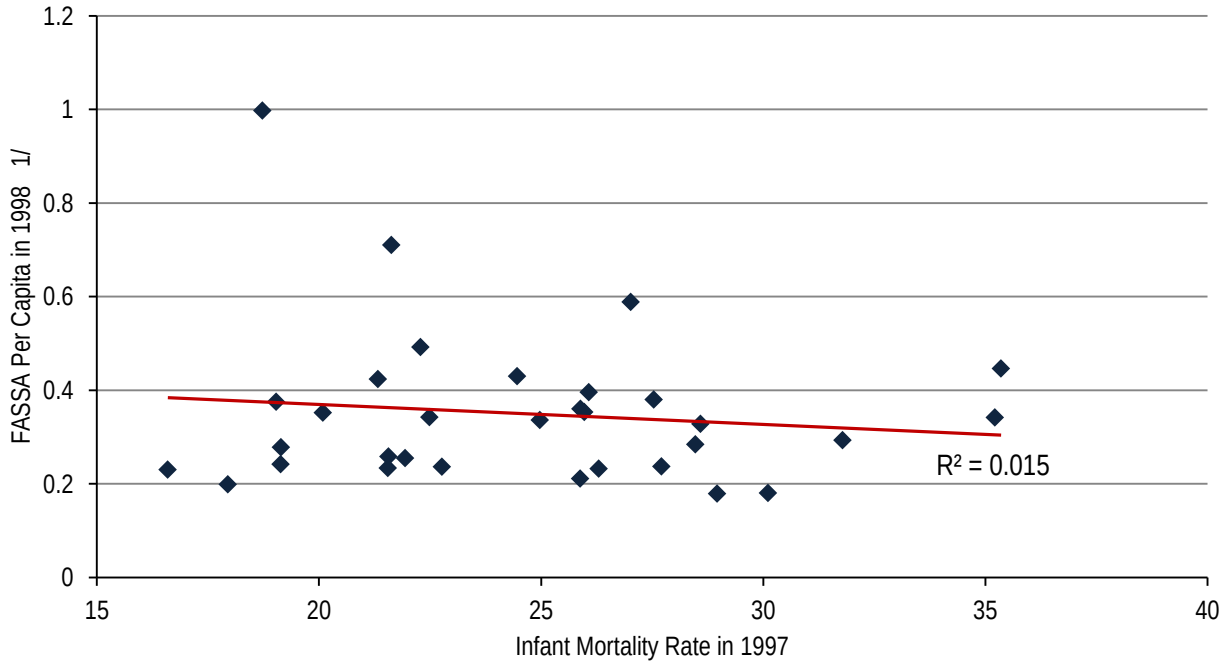
Note: Units expressed in 2010 pesos.
Source: Own elaboration with data from SINAIS and the Ministry of Health.

Figure 5: Ramo 12 & FASSA Per Capita
Selected States



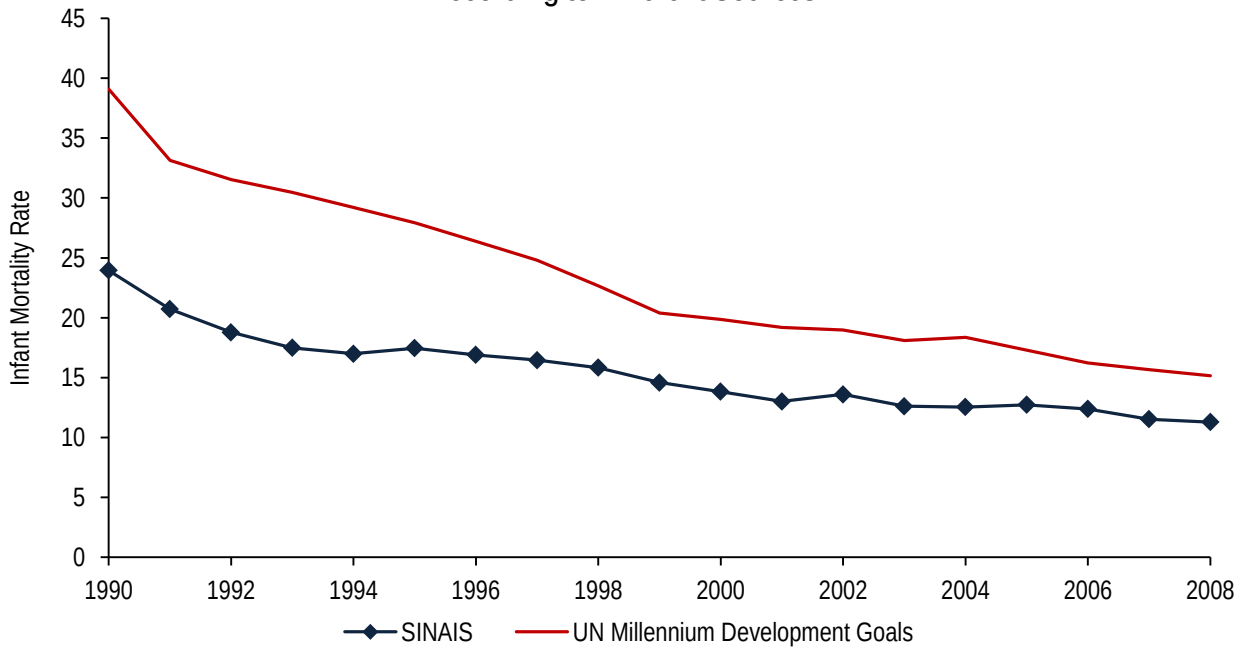
Note: Units expressed in 2010 pesos.
Source: Own elaboration with data from SINAIS and the Ministry of Health.

Figure 6: Infant Mortality Rate in 1997 vs. FASSA Per Capita in 1998



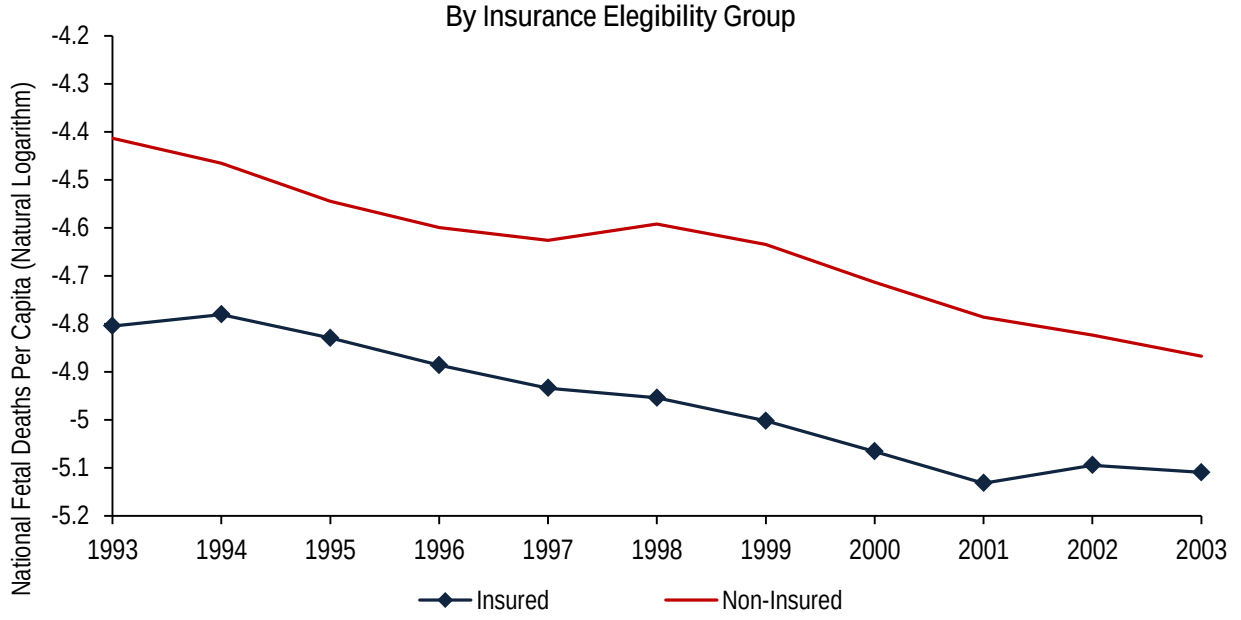
1/ Units expressed in 2010 pesos.
Source: Own elaboration with data from the Ministry of Health and UN Millennium Development Goals.

Figure 7: National Infant Mortality Rate
According to Different Sources



Note: The Insured Fetal Deaths Per Capita accounts for the Fetal Deaths of mothers who reported having some kind of medical insurance (i.e. IMSS, ISSSTE, PEMEX, SEDENA, SEMAR or other institutions). Whereas the Non-Insured Fetal Deaths Per Capita accounts for the Fetal Deaths of mothers who reported not having any kind of medical insurance.
Source: Own elaboration with data from INEGI.

Graph 8: National Fetal Deaths Per Capita (Natural Logarithm)
By Insurance Elegibility Group



Note: IMR is the Infant Mortality Rate used along all the paper and it published by UN Millennium Development Goals. In the other hand, IMR Biased is the Infant Mortality Rate that was constructed with data from the Mexican Bureau of Health Statistics, SINAIS.
Source: Own elaboration with data from SINAIS and UN Millennium Development Goals.